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WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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American Foundrymen's Convention

A Report of the Joint Meeting of the American Foundrymen's Association and the Institute of Metals Division, and the Exhibition of Foundry Equipment, Held in Syracuse, N. Y., October 5-9, 1925

The 1925 convention of the American Foundrymen's Association in conjunction with the fall meeting of the Institute of Metals Division was held in Syracuse, New York, October 5-9, 1925. The plans developed at previous meetings for the arrangement of exhibits were adhered to, the "still" exhibits being placed in one section and the "live" or noisy exhibits, such as molding machines, etc., were grouped in another. The attendance was about 3,500, somewhat less than that last year in Milwaukee, but it was noticeable that the type of visitors was of a much more satisfactory grade. There was little or no sight-seeing by the general public, those present being interested, from a practical point of view, in the foundry industry. As a result, the exhibitors wasted no time and felt that this condition was a decided improvement over a large attendance of curiosity seekers.

Following the usual custom, no hotel was designated as official headquarters, all activities being centered at the New York State Fair Grounds.

EXHIBITS

The grade of the equipment and booth decorations was of a very high order. Booths were attractively furnished by the exhibitors and a number of new and interesting devices were shown. Among those of particular interest to brass foundrymen were the following:

Double-pot soft metal melting furnace and a tilting or stationary coke, coal or wood fired **reverberatory furnace** for smelting, melting and refining metals. These furnaces are made by the Monarch Engineering & Manufacturing Company of Baltimore, Md.

Air-operated core blowing machine, built for low air pressure, by Wm. Demmler & Brothers, Kewanee, Ill. This machine was in actual operation at the convention, making a number of complex cores. A more detailed description will appear in a later issue of THE METAL INDUSTRY.

A **"safety-automatic" wrench** made by the Ajax Wrench Company of New York. This wrench is adjustable to almost any size, works in either direction, operates like a ratchet so that a nut can be screwed on without resetting the wrench.

Foundry shoes made by the Rohrbacher Shoe Company of Boston, Mass., built to be safe for use in the foundry, and to slip on and off quickly.

The **Wood process molding machine** made by the Foundries Service Corporation of New York, who gave a very interesting demonstration of this new method of molding. In this machine (either hand or power operated) the flask, both cope and drag, is permanently attached to the machine. The flasks are made in several standard patterns to suit varying dimensions of pattern plates; and in this process of sand molding, they are the only flasks necessary to coring operations.

Operators of Wood machines make the mold complete, including the coring, before it leaves the machine, the cope being finally assembled to the drag, it is claimed, in exact register, thus eliminating all danger of loss due to shifts. With the equipment there are furnished pouring jackets which are machined to exact inside taper and dimensions of the flask so that a perfect fit for the mold is assured when the jacket is placed in position for pouring operations. These pouring jackets are of grill work construction with hinged clamps which hook to the under side of the board, rigidly securing the mold in position, and it is said, obviating entirely the use of all weights, clamps and wedges. By making the complete mold in the one operation, it is claimed that the Wood machine operator is able to place his mold on the floor in one-half the time taken under ordinary methods.

It is stated in addition that the design and the machine-like precision of the various operations involved in the making of the mold result in very low casting losses; between one and two per cent. A great advantage claimed for this machine is the complete elimination of flasks in the foundry making duplicate parts thereby also eliminating the flask repair shop and its incidental costs.

There will be published at a later date a complete and illustrated description of this machine.

BRASS FOUNDRY ROUND TABLE

A special occasion for brass foundrymen was a luncheon and round table discussion of brass foundry problems held in joint session between the American

Foundrymen's Association and the Institute. A free discussion prevailed as those present were assured that no names would be mentioned in print. The result was perfect freedom of utterance. Among the subjects discussed were the following:

- Flasks in the brass foundry
- Gating of brass castings
- Pyrometers
- Gases in metals
- Furnace atmospheres
- Nickel in brass

To say that any conclusions were reached would of course be impossible. The above discussions of these questions and the work of investigating them are still too recent for the industry as a whole to have arrived at any definite decision about them. The majority, however, seemed to feel that most fluxes were of little use; that pyrometers were a decided improvement on the old visual method of determining temperatures; that nickel was decidedly advantageous in small amounts, say up to one per cent, in brass castings. The other questions were left wide open.

INSTITUTE DINNER

At the annual dinner of the Institute of Metals Divisions, which was as usual, well attended and most enjoyable, Secretary Corse reported on the plans for the Institute for the coming year. An announcement of these plans when authorized, will be published in THE METAL INDUSTRY. Other speakers addressed the meeting, among whom were Mr. Eiseman, secretary of the American Society for Steel Treating, and L. W. Olson, past president of the American Foundrymen's Association.

G. H. Clamer, also past president of the American Foundrymen's Association gave his experiences on his recent European trip, in which he found that Europe was clearly recovering from her industrial troubles, with Germany showing the most promise. In England there seemed to be the greatest difficulties. Dr. Hoyt gave his experience on a European trip in which he visited most of the important metallurgical laboratories both in England and on the continent.

The convention included a number of social activities among which were the annual banquet held on Thursday evening, October 8 at the Hotel Syracuse. James A. Emery of Washington, D. C., was the speaker, and the Seaman and McFadden medals were presented to Dr. Richard Moldenke and Dr. R. J. Anderson respectively. The banquet was followed by dancing. Several country clubs extended golf privileges to the foundrymen.

BASE BALL GAME

A base ball game between teams representing the Exhibitors and the American Foundrymen's Association members was played at the Fair Grounds on, Thursday, October 8, at 3 P. M. The Exhibitors won by a score of 6 to 3.

The teams which were managed by W. M. Nantke of North Tonawanda, New York, and S. H. Jasper of Cleveland, Ohio, lined up as follows before a large and enthusiastic assemblage of fans:

EXHIBITORS	FOUNDRYMEN
Nantke, l. f.	Carey, p.
Schwerman, p.	Lescher, 1 b.
Hughes, 2 b.	Weichert 3 b.
Greaves, c. f.	Jans, c. f.
Herr, r. f.	Schirmer, c.
Bregman, c.	Graham, 2 b.
Beaulac, s. s.	Booth, s. s.
Case, 1 b.	Dunbeck, r. f.
Fowler, 3 b.	Rider, l. f.

SCORE

Foundrymen	0	2	0	0	0	0	1—3
Exhibitors	4	1	0	0	0	1	x—6

The feature of the game was the very fine pitching of Schwerman of the Exhibitors' team.

NEXT CONVENTION IN DETROIT

Announcement was made of the next annual convention. It will be held during the fall of 1926 in Detroit Mich.

Abstracts of Papers Read at the Technical Sessions

SOME REFRACTORY PROBLEMS IN THE NON-FERROUS ELECTRIC FURNACE CASTING SHOP

By G. F. HUGHES, Bridgeport, Conn.

The writer, from his experiences with the induction and rocking arc electric melting furnaces, discusses the refractory problem when using such furnaces to melt yellow brass, copper-tin alloys and that which has been done and remains to be done to bring the induction furnace into the field where its use may be universal in non-ferrous melting. The two melting mediums to be considered are the crucible which is a heat conductor and the type of furnace which acts as an insulator such as the electrically heated and the reverberatory type of oil or gas fired furnace, this paper dealing with the second class of melting medium.

The author discusses the lining construction of the induction furnace together with method of operation to secure best results. Careful preheating of the newly lined furnace is one of the most important factors. Refractory cements also are considered in detail. The progress of the work to date has brought the conclusion that the problems must be solved in one of two ways: either that a refractory must be used in which vitrifaction will not take place under the working temperatures involved, at least to such an extent that the cross section of the lining affected will crack throughout, or two different layers of lining material must be used to accomplish the desired result.

AIRCRAFT CASTINGS IN ALUMINUM ALLOYS

By SAMUEL DANIELS, Dayton, Ohio

The Air Service, U. S. Army, uses regularly six alloys for casting purposes, the composition and attributes of which may be summarized in the follwing manner:

AIR SERVICE FOUNDRY ALLOYS

Reference Alloys	Composition		Uses and Properties
1	92	Aluminum—8 Copper	For general run of foundry castings. Low strength and ductility.
2	88.5 1.25	Aluminum—10 Copper Iron—0.25 Megnesium	For parts subjected to elevated temperature.
3	95.75 1.25	Aluminum—2.5 Copper Iron—0.5 Magnesium	For parts requiring good strength and ductility as cast.
4	94.0 1.0	Aluminum—5 Copper Silicon	For highly stressed parts subjected to shock and warranting the heat treatment necessary.
5	93.0 3.0	Aluminum—4 Copper Silicon	For complicated castings with abrupt changes in cross-section.
6	92.5 2.0	Aluminum—4 Copper Nickel—1.5 Magnesium	For parts subjected to elevated temperature.

Alloys of other composition but of suitable foundry, physical, and mechanical properties may, after granted deviation, be substituted for those already enumerated, particularly with reference to alloys 3 and 4.

The preparation of these alloys, their characteristics, and the tests and methods of inspection required are explained for the foundryman.

DISCUSSION

Mr. Waechter asked about the corrosion qualities of the various alloys. **Mr. Daniels** answered that the addition of silicon increased the resistance to corrosion of aluminum alloys; also increased the soundness and decreased shrinkage. The eight per cent copper alloy is the least resistant to corrosion.

In answer to a question about warping and swelling of aluminum alloys, **Mr. Daniels** pointed out that with alloys No. 2 and No. 6, noted above, heat treatment would set them permanently; No. 4 gave the most trouble.

X-RAY EXAMINATION OF ALUMINUM-ALLOY CASTINGS FOR INTERNAL DEFECTS

By Robert J. Anderson, Cleveland, Ohio

The object of this paper is to discuss the application of X-Ray examination to aluminum-alloy castings and to present the results of some recent experimental work. X-Ray examination promises to be one of the most important testing methods in foundry practice, and it is particularly well adapted to aluminum-alloy castings because of the relatively high transparency of aluminum. The advantages of the X-Ray examination method are stated to be:

(1) Inspection may be made without cutting or otherwise damaging parts. (2) Dangerous flaws which might cause failures can be detected before the parts are put in service. (3) Flaws which might be uncovered in machining can be located before expensive machine work is done. (4) Correlation of the nature, amount, and distribution of internal defects in castings may be made with the method of gating or some other important factor, thus permitting the use of smaller sections and a lower factor of safety with simultaneous decrease in cost. The cost for aluminum-alloy examinations is stated to be relatively low when using radiator type tubes.

The apparatus and equipment for radiography is described together with the method of making exposures for examination of aluminum-alloys. In the experiments detailed, two types of equipment were used: a Victor-type deep therapy machine with high voltage Coolidge tube capable of operation up to about 260 kv., and a self-rectifying unit, with a radiator-type Coolidge tube, capable of operation in the range 55-90 kv. Typical radiographs made on some aluminum-alloy castings are illustrated and explained.

DISCUSSION

Mr. Daniels asked about the cost of making X-Ray photographs on a commercial scale. **Dr. Anderson** replied that in sufficient volume, they could be made for about **$5.00 to $10.00 per photo.**

PERMANENT MOLD ALUMINUM CASTINGS AND THEIR FIELD OF USEFULNESS

By J. B. Chaffe, Jr., Cleveland, Ohio

Permanent mold aluminum castings are defined as those made by pouring molten aluminum alloys into warm metal molds with no external pressure applied to the metal. This definition is to distinguish such castings from those made by the die casting process. The greatest difficulty encountered is that caused by crystallization shrinkage which is the shrinkage in volume on freezing, and amounts from 7 to 5 per cent of the volume of the molten metal. To get a solid casting this shrinkage must be fed with hot metal and the molds are therefore designed so that there is a progressive freezing from the points furthest from the gates to the metal in the gates and sprues. Venting of the mold must also be considered as well as the thermal expansion. The author compares the sand casting method with the permanent mold method to bring out those factors which must be watched. Many points of sand casting are not applicable to the permanent mold process. Defects of the permanent mold casting show on the surface and are easily detected. The author further discusses pressure die castings and permanent mold castings showing the important differences in the two processes.

DISCUSSION

Considerable discussion ensued after this paper and questions were asked from every corner of the room. **Mr. Waechter** asked about the advantages of permanent mold casting over pressure die casting and **Mr. Chaffe** answered that die castings always had blow-holes while permanent mold castings could be made sound. **Mr. Daniels** asked how the mold temperatures were kept constant, if at all. **Mr. Chaffe** explained that this was done wherever possible by maintaining a constant rate of pouring. The mold was started hot, that is heated up to the proper temperature before pouring was begun. The maintenance of the mold temperature is one of the most important factors in permanent mold casting. At times water cooling is necessary.

Mr. Binney asked if any trouble had been experienced with castings sticking to the molds and fins forming. **Mr. Chaffee** stated that all molds would eventually warp and have to be refaced. A mold should last from 50,000 to 75,000 castings. There should be no sticking unless around a core, which must be built at the right time to avoid sticking and to keep molten metal from flowing out. In answer to a question from **Mr. Waechter** concerning mold gating, **Mr. Chaffe** replied that a lime wash and sodium silicate were used, but with care, as they might show up in the finished casting. Iron molds were found to last better, that is to warp much less than steel, but they would chip on the edges. It was not practical to use heat-treated steel for cores and dies as they got too hot, thus eliminating the effect of the heat treatment. High speed steel had not been found very successful.

MECHANICAL PROPERTIES OF THE ALUMINUM-COPPER-SILICON ALLOY AS SAND CAST AND AS HEAT TREATED

By Samuel Daniels and D. M. Warner, Dayton, Ohio

In this paper are given the mechanical properties, determined by the Engineering Division, Air Service, U. S. A., of the 94 per cent aluminum, 5 per cent copper, 1 per cent silicon alloy as sand-cast and as heat-treated commercial to Air Service Specification No. 11,300. This particular alloy was tested both in the cast and in the heat-treated condition. Tension and tension modulus values were obtained from machined and from un-machined test specimens; while data for shear, compression, impact, torsion, and for Brinell and Rockwell hardness were found from machined bars. Specific-gravity tests were made on sanded, un-machined specimens. The metallography of the alloy is useful as a control to heat treatment and presents some interesting peculiarities in regard to the two iron-bearing compounds.

SOME NOTES ON THE FOUNDING OF LIGHT ALLOYS

By R. de Fleury, Paris, France, Translated from the French by Dr. R. J. Anderson

The peculiarities encountered in the founding of light aluminum-alloys are due to the properties of aluminum and these peculiarities may be affected by impurities, by improper methods of founding and by alloying elements used. The purpose of this paper is to discuss these factors in some detail since they are important as regards the kind of foundry equipment to be used and the application of the resulting castings.

The author first discusses in detail the factors of raw materials such as primary aluminum, aluminum scraps, alloying metals, and fluxes. The effect of impurities such as iron, dissolved gases and alumina are considered together with types of furnaces for melting. The properties of the aluminum-alloys for founding, which include the aluminum-copper, aluminum-copper-zinc and aluminum-silicon are discussed and also presented in tabular form.

The high contraction of light alloys is stated to make the casting of these alloys entirely different as to foundry problems from the cast irons. The high contraction of light aluminum-alloys and their tendency to pipe are the most important difficulties encountered in founding and these factors are stated to make the founding of these light alloys considerably different from the usual methods employed in bronze practice which entails the use of long feeders with local risers. In the case of aluminum-alloys it is necessary to avoid long feeders and to use risers only when essential. Steel foundry practice is said to be, in general, much like aluminum-alloy founding except that in the latter much thinner castings can be poured because of greater fluidity. The author recommends that the various points brought up in this paper be given close attention in order that good castings may be produced at the least and with a minimum of wasters.

NOTES ON THE FATIGUE OF NON-FERROUS METALS

By H. F. Moore, University of Illinois

The phenomenon know as "fatigue" of metals is really a progressive fracture of metals. A minute (probably submicroscopic) crack is formed in the metal, the internal stress is intensified at the ends of the crack, and under successive applications of load the crack spreads like a minute hacksaw cut until there is not enough sound metal left in the cross-section of the piece to stand the load applied, and then failure occurs suddenly.

For wrought ferrous metals, there is a limited intensity of stress (as computed by the ordinary formulas of mechanics of materials) below which a metal is able to withstand an indefinitely large number of repetitions of stress without failure. This limiting stress is known as the "endurance limit or the fatigue limit." For reversed flexure, the endurance limit for wrought ferrous metals is usually not far from 50 per cent of the ultimate tensile strength.

The endurance limit is not so clearly defined for the non-ferrous metals tested as it is for wrought ferrous metals. The ratio of endurance limit to tensile strength is much lower for the non-ferrous metals tested than for wrought ferrous metals. This ratio for non-ferrous metals varries from 25 to 40 per cent.

The ordinary formulas of mechanics of materials are based on assumptions of homogeneity of material and of regularity of stress-distribution throughout the material. These assumptions imply a much simpler condition than actually exists in metals and other materials of construction; they give a picture of stress-distribution that may be regarded as accurate in a general, statistical way. Even in the case of progressive failure under repeated stress, the ordinary assumptions and formulas of mechanics of materials are found useful, though they cannot be regarded as rigidly true.

ENDURANCE PROPERTIES OF NON-FERROUS METALS

By D. J. McAdam, Jr., Annapolis, Md.

A survey of the results obtained at three laboratories has given no reason to change the conclusions, expressed by the writer about a year ago and in recent papers, that non-ferrous metals have endurance limits as definite as those of ferrous metals. The endurance limit can be practically determined by the rotating-cantilever method by individual tests of not more than 50,000,000 cycles. In recent papers the entire series of nickel-copper alloys have been shown to have definite endurance limits. The weight of evidence, therefore, against the abnormal graph for Monel metal obtained at the University of Illinois is great. Similarly the weight of evidence is against the abnormal graph for duralumin obtained at McCook Field. Over a year ago, the Naval Experiment Station considered the evidence against the abnormal graph for duralumin obtained at McCook Field. Over a year ago, the Naval Experiment Station considered the evidence for the existence of an endurance limit for non-ferrous metals conclusive. We then proceeded to investigate the effect of three variables, heat-treatment, cold-working and chemical composition. Results of correlation of endurance properties with these variables are given in recent papers.

DISCUSSION

Mr. Moore was not present but sent in a long written discussion, differing with Mr. McAdam's conclusions. Other communications were read, to which Mr. McAdam replied with spirit. The question at issue was whether or not non-ferrous metals have a well defined endurance limit.

THE ANNEALING CRACKING OF THE NICKEL SILVERS

By E. O. Jones, Manchester, England, and E. Whitehead, Woolwich, England

It has been shown that nickel silvers may crack either during the heating or while cooling after annealing. The former is the usual fire-crack and is characterized by the fact that it is clearly oxidized. If the cooling rate is high, as in quenching, cracking may again occur; these cracks, however, are unoxidized and clean. Especially in the case of alloys of high nickel content is the trouble that may arise from cracking in quenching serious. It does not appear that the quenching crack is produced unless the temperature from which the material has been cooled has exceeded 600° C.

It has been shown that the typical fire-crack occurs at a temperature around 350° C. Probably the trouble is associated with the fact, discovered by Le Chatelier, that in these alloys a change takes place around 320° C. If this temperature is safely passed, the chances of cracking during further heating to a higher temperature are exceedingly small.

It has been shown that the conditions under which the specimen is heated exert a marked influence on the tendency to crack. The more gradual and uniform the heating, the less likelihood is there that the article will develop cracks. Contact with flame is liable to cause cracking. One manufacturer found that by close annealing in a

muffle furnace there was much less wastage from this cause than occurred in furnaces in which the flame came into actual contact with metal being annealed. The same fact was clearly discerned in the work recorded on the temperature at which the cracks were formed. Cups of severely spun alloys that cracked with the utmost readiness when annealed in the flame of a blow-lamp resisted most obstinately the tendency to crack when heated in a muffle.

Other causes of increased tendency to crack are: (1) Impure metal, especially where there is much impurity in the form of inclusions of oxides, slag, graphite, lead, tin-bearing constituents, etc. Quite apart from chemical composition in the ordinary sense, "dirty" metal due to casting conditions is very likely to crack. The "non-cracking" nickel silvers are all very pure.

It has been shown, as Doctor Hutton first suggested, that an annealing at a low temperature, below that at which the cracks are formed, will reduce the internal stresses to such a limit that cracking will not occur. Further, such a treatment will tend to equalize the stresses with the result again that they will be less harmful. By heating the metal to 250° C. and by keeping it at that temperature for about 1 hr. the stresses are reduced to a limit at which they are most unlikely to cause trouble; at 300° C., ½ hr. is sufficient. These results offer a ready means of eliminating this trouble. A sufficiently high temperature could be attained in a furnace heated by waste heat from an annealing furnace, and the cost of treatment should be quite small.

DISCUSSION

Mr. Price, who read the paper in the absence of the author, stated in discussing it, that fire cracking was very well understood in the United States. It was caused by uneven expansion and contraction which might occur in any department of a mill, such as rolling, annealing, etc. Proper precautions to prevent such uneven expansions and contractions, would eliminate the cracking.

SPECIAL NICKEL BRASSES

By Oliver Smalley, New York

The author treated the development of complex nickel-brass, considering commoner metals, including nickel as a third element and proceeded to study nickel as a fourth element on the most promising of the ternary series; as a fifth element on the quarternary series, and so on to the more complex alloys. The author performed physical tests, and showed the micro-structure of cast and forged materials, tabulating his results. He also discussed questions of foundry practice such as impurities, melting, the use of scrap, casting and pouring methods.

New High Frequency Induction Furnaces

A Paper Read at the Syracuse Meeting of the American Foundrymen's Association, October 5-9, 1925

By DUDLEY WILLCOX

Ajax Electrothermic Corporation, Trenton, N. J.

The high frequency induction furnace described in this paper was developed in an effort to make the ideal brass melting furnace which was conceived to have the following characteristics:

1. The shape of the metal bath to approach that of a cylinder whose height is equal to its diameter because this shape has small radiating surface per unit volume.
2. Little or no waste space to be above the melt.
3. Aperature for charging to be large and easily accessible.
4. Pouring spout arranged so that molds can be poured from the furnace if desired.
5. Heat to be generated uniformly throughout the mass to be melted.
6. Thorough mixing of alloys without use of stirring rod or any motion of furnace.
7. Minimum refractory material to be heated.
8. Crucible removable for pouring if desired.
9. Standard shaped crucible to be used.
10. High efficiency.
11. High power factor and steady, well balanced polyphase load.

It was found that the use of high frequency current made attainable all of these advantages. The furnace for foundry use is designed as illustrated in Fig. 1 (cross sectional view of furnace). The metal is melted in a crucible surrounded by heat insulating material. The heat is applied by induction within the metal. The crucible requires no preheating.

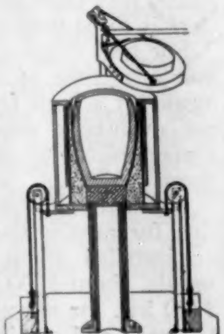

FIG. 1. CROSS SECTION OF FURNACE.

There is no electrical connection between the crucible and the electrical circuit. The energy is supplied by electro-magnetic induction from a coil surrounding the crucible and separated from it by about one inch. Between the coil and the crucible there is a heat insulating lining through which the electrical energy passes without in any way affecting the lining material.

The lining has small mass in which little heat is stored. The coil consumes but little power and is kept cool by

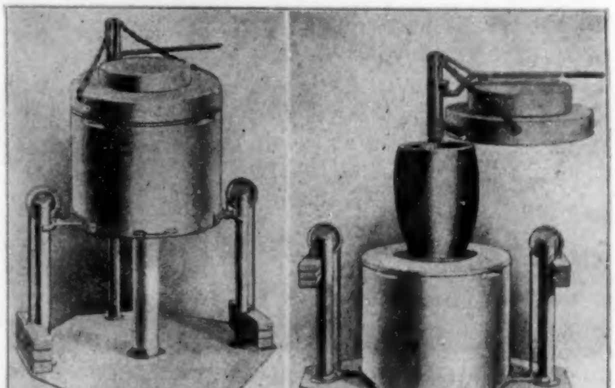

FIG. 2. FURNACE IN MELTING POSITION. FIG. 3. FURNACE LOWERED TO REMOVE CRUCIBLE.

means of a gentle air blast. The furnace is housed in a cylinder or box of non-conducting material such as asbestos board. Fig. 2 shows the furnace in melting position.

OPERATING

The metal is charged as in an ordinary fuel fired crucible furnace. There are no flames except what little may come off from oil or other matter on the scrap metal being melted. The outside of the furnace is at all times cool to the hand.

As shown in Fig. 3, the furnace housing may be lowered away from the crucible so that the crucible may be picked up with ordinary tongs and poured. Contrary to the usual condition the outside of the crucible is never heated hotter than the metal. This of course means that the crucible life is much longer than when the heat has to be passed through the crucible wall. Electromagnetic energy instead of heat passes from the outside to the inside of the crucible producing heat only where it is wanted, in the metal.

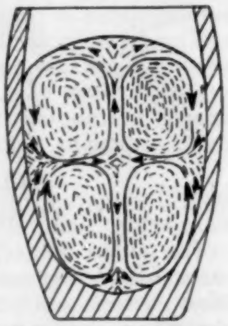

FIG. 4. LINES OF FLOW OF MELTED METAL IN CRUCIBLE.

As soon as the metal starts to melt so that a pool is formed in the bottom of the crucible, violent stirring occurs in the metal due to the attraction of currents set up in the outside of the bath. Fig. 4 indicates the direction of the lines of metal flow through any vertical section of the crucible. The action is such that the metal is elevated in the center about 2 inches higher than at the crucible wall. Flow lines of metal are plainly visible on the top of the metal bath going from the center radially in all directions to the edge. As the metal is forced away from the wall of the crucible there is no wearing away due to stirring. Floating lumps of metal stay in or near the center of the crucible.

There is practically nothing to wear out about the furnace except the crucibles. The lining outside of the crucible is never in contact with molten metal except when a crucible breaks and the lining is not heated enough to cause any disintegration. There is, of course, some abrasion of the lining wall as it slides up and down the crucible but if the crucible is well centered, the life of the lining is very long.

The furnace housing is counterweighted and in the design shown in the illustrations the housing is supplied with a handle by means of which it can be raised and lowered without the use of power. In larger sizes provision is made for raising and lowering the housing by means of two air cylinders.

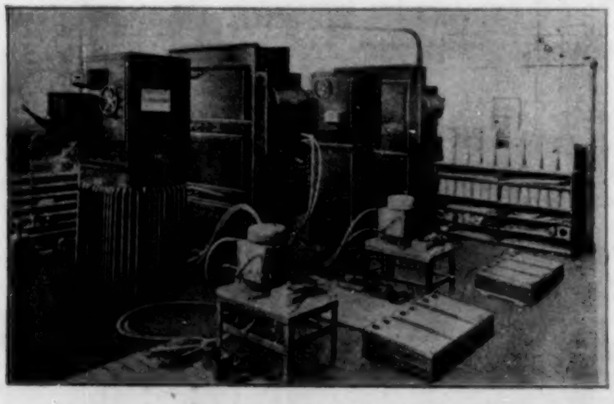

FIG. 5. INSTALLATION OF HIGH FREQUENCY CONVERTER AND TWO FURNACES.

POWER

The power for operating these furnaces is derived from a generator of standard design driven by an ordinary induction motor or a synchronous motor. A number of condensers are also provided for bringing the power factor of the furnace circuit to unity. The power factor of the driving motor is usually about 90 per cent unless a synchronous motor is used in which case it can be made unity or leading.

The efficiency of the equipment is comparable with that of other electric furnaces operating on a 24 hour per day schedule. The high frequency induction furnace falls off very little in efficiency when operated for only a few heats at a time. An example of the superiority of this murnace over another make is given in the following table:

Hours Operation	High Frequency Furnace Lbs. per kw-h.	Kw-h. per ton	Other Furnace Kw-h. per ton
8	6.60	303	351
9	6.63	302	338
10	6.68	299	325
24 x 5 = 120	6.95	287	...
Continuous	7.00	286	273

The figures refer to red brass. On yellow brass the kw-h. per ton are about 20 per cent lower. The first melt takes about one and a half times as long as subsequent melts.

APPLICATION TO SPECIAL ALLOYS

The high frequency induction furnace has also proved practical for melting ferrous alloys in small quantities when the absence of carbon is not so important. Fig. 5 shows an installation of two 15 pound high frequency furnaces which are being operated at the West Lynn plant of the General Electric Company. The metal melted is known as thermalloy and consists of 30 per cent copper, 66½ per cent nickel and 2 2/10 per cent iron. The balance or 1 3/10 per cent consists of impurities. For such small furnaces a very high frequency current is used. Commercial power is transformed into high frequency power by means of a static apparatus known as a high frequency converter. Two such converters appear in Fig. 5.

A very interesting development of high frequency furnaces has been carried on in England where the Gutta Percha Company have installed 46 units similar to those shown in Fig. 5. Sixteen pound charges of very low carbon nickel-iron alloy are melted. The crucibles in which the metal is melted are made of clay without graphite. Four of the 46 furnaces have been in use for a year or more. Sixteen were installed early in 1925 and the remaining 26 during the spring and summer of 1925.

APPLICATION TO HEAT TREATING

In addition to melting all kinds of metals the furnace principle makes possible the heat treatment of steel and other materials. When heating magnetic metals the furnace circuit is affected when the temperature reaches the recalescense point (about 1380 degree Fahr.) so that it is possible easily to arrange for automatic adjustment of the power supply to produce uniform heating. Thus it is possible to heat treat steel without any danger of passing the recalescense point. Strips or bars of steel can be passed continuously through high frequency furnace coils placed very close to the rolls or drop hammer in which the steel is to be worked.

For heat treating or annealing small pieces of metal a muffle or tube of heat resistant metal can be heated by means of a high frequency furnace coil around it. It is not ordinarily practicable to heat small or irregularly shaped pieces of metal by inducing current directly to them.

Summarizing the development of high frequency induction furnaces to the present time there are now on order or installed about 1500 kw. for melting non-ferrous metals, about 1200 kw. for melting ferrous metals, about 1300 kw. for miscellaneous high temperature experimental work and melting precious metals. We look forward confidently to a large expansion of the use of these furnaces for melting both ferrous and non-ferrous metals and for heat treating and annealing.

Atomized Coal System of Non-Ferrous Melting

A Paper Read at the Syracuse Meeting of the American Foundrymen's Association, October 5-9, 1925

By R. BLACK and C. L. SHAFER,
Gibraltar Bronze Company, Cincinnati, O.

The atomized coal system is a name applied to the use of specially prepared bituminous coal for melting non-ferrous metals. The experience had to date has been confined to the crucible type of furnace. The coal is treated so as to reduce it to an impalpable powder resembling flour in texture. The coal so treated is called atomized coal. The reduction of coal to a powdered form is well known, and its use for industrial heat is well established. A good survey of the field can be found in Bulletin No. 217, U. S. Bureau of Mines.

We distinguish atomized coal from powdered coal as powdered coal is practically standardized to have 75 per cent pass a screen of 200 openings to the lineal inch and all of it pass a screen of 80 openings to the lineal inch, while atomized coal must all pass through a 200 mesh screen and contain grains of further diminishing sizes to the infinitely small. That this difference is substantial is shown by our experience that it is not practical to maintain a fire with powdered coal in the standard crucible furnace, although we have been very successful in this respect with atomized coal.

PREPARATION

Atomized coal is prepared in a succession of steps from nut and slack bituminous coal. It is first passed through a crusher reducing the whole volume to not exceeding the size of wheat grains: then it is passed through a drier to remove moisture. It is an essential part of the process that the coal must be rendered bone dry so far as it is commercially practicable. From the drier it is then passed through an atomizer which is a tumbling rod mill into which the coal is fed by a screw conveyor through the axle of the mill and in which the coal is kept in agitation by an air blast. The drier has a function of not only removing the moisture but of dissipating the methane gas held between the coal layers. The dissipation of the methane gas has the result of rendering the final product non-explosive within practical commercial limits. In the atomizers, the coal has become atomized coal and it is removed by a suction fan while suspended in air. The coal laden air is conducted into dust collectors from which the fuel drops into strong paper sacks for convenient handling.

BURNING THE ATOMIZED COAL

The sacks will contain a fluffy mass of coal flour that will require special apparatus to feed it into the place of combustion with the proper amount of combustion air.

This is accomplished by a machine called a carburetor, consisting primarily of a storage tank, a revolving disk and a motor driven fan. The motor driving the fan, which is housed in an aluminum shell, also drives the revolving disk at a rate of 18 revolutions per minute. The disk constitutes the bottom of the storage tank which is a cylinder of galvanized iron with a capacity of 300 pounds of coal. Mounted on the disk is a cone with projecting arms which at once supports the mass and agitates it to overcome packing or lodging. As the disk revolves, a tangentially placed knife cuts and scrapes off a variable amount of coal controlled by adjusting the angle of the knife. This coal drops off the knife into the fan opening which blows a mixture of coal laden air through a pipe into the furnace. In the foundry of The Gibraltar Bronze Company two furnaces are connected to one carburetor by a "Y" pipe with valves so that either one or both may be operated. In experiments as many as four furnaces have been connected to one carburetor, but we believe the most satisfactory control can be obtained by not exceeding two furnaces for a carburetor. There is a shutter control for air built in the blower so as the supply of coal is varied the air can be adjusted in compensation. We redesigned the carburetor ourselves and the moving parts consist of the disk, two gears and a worm drive. It occupies a space 3 feet in diameter by 5 feet in height and weighs 350 pounds.

THEORY OF PRACTICE

The theory of practice that has been heretofore worked out for the air requirements in the combustion of powdered coal of the standard type do not hold good with atomized coal. We have steadily diminished the air supply and combustion space with a correspondent increase in efficiency and economy of coal. The coal laden air as mixed and blown into the furnace is under a pressure of three ounces to the inch or just about sufficient to move the coal, suspended in air, into the furnace. This has the effect of preventing any excess of oxygen and in conjunction with the restricted combustion space of producing a strictly reducing atmosphere so that losses from oxidation are negligible.

TYPE OF FURNACE USED

The furnace used is the standard crucible furnace consisting of an iron shell lined with a refractory and covered with a refractory lid with a four inch orifice directly over the crucible. A collapsible stack is erected over the furnace so that it may be drawn down closely to the lid while firing and elevated to permit withdrawal of the charge. While firing with the stack drawn down the escape for the products of combustion is directly over the crucible with the result that the non-combustible content of the coal is melted and deposited as slag upon the surface of the charge. This slag acts as an impenetrable seal effectively closing the content of the charge and so limiting losses by oxidation and by the absorption of gases or other impurity. The slag also acts as a flux and assists in the cleansing of the metal. It readily comes off with a skimmer after drawing the crucible. The pipe conveying the coal laden air enters the furnace through a vertical slit in the side of the furnace to enter which the pipe is flattened to a hognose. The pipe is so arranged that the coal laden air enters the furnace tangentially, giving a whirling motion to the flame around the crucible and ascending to the opening above.

Our experience has been in aluminum, brass and bronze with very satisfactory results. In melting red brass, the amount of fuel varies with the required heat to the charge and the cost of melting varies in proportion. Thin castings take a greater heat and more coal. Chunky pieces of relatively large size are, of course, poured at a less cost. The largest weighed 450 pounds.

COST OF ATOMIZING COAL

Atomized coal has not as yet been manufactured upon a commercial scale so that the proportion of overhead and fixed charges per ton has been relatively high. The cost of material, process and sacking is about $4.85 per ton. The plant investment for preparation is about $125,000.00. A charge for capital, interest and depreciation, administration and sales has raised the cost on a small

production to $8.00 per ton, which with freight, has made the cost to us $12.00 per ton. The fuel comes in stout paper sacks averaging 40 pounds to a sack about the size of a cement sack. It is shipped in box cars to protect it from weather and has a freight classification as a manufactured product much higher than raw coal.

COST OF MELTING

At $12.00 per ton, the cost is .6 of a cent per pound. We will run three pounds of very hot metal per pound of coal at a cost of 2 mills per pound and six pounds of metal per pound of coal for very heavy chunky castings at a cost of one mill per pound. Our average experience with medium small castings is four pounds of metal are melted per pound of coal at a cost of one and one-half mills per pound of metal melted. This is our red brass and bronze experience. With aluminum our cost is much lower.

We believe this cost of melting, as given, is considerably lower than other available fuels used in crucible processes, but such saving in cost is a small factor in estimating the worth of this process. We find the life of our crucibles to be prolonged 200 per cent. We use a crucible to between 130 and 140 heats with red brass and find it to be still serviceable for aluminum. We have used the same furnace lids for ten months and renew the furnace lining at intervals of six months. This is accomplished through the protective coating of slag from the melting of ash content of the coal and the maintaining of a reducing atmosphere of carbon monoxide in the combustion chamber. Our loss by oxidation of metal does not amount to over half of one per cent, as it is protected by the atmosphere and by the deposit of slag on top.

We have had the experience of an extraordinary low loss in defects. We have had only one experience of porous metal in castings and that we ascribe to the ingots in that instance being burnt by the smelter. We have sold castings of all descriptions in ten months' operation, most of which were machined and while we had returns because of defects in molding and rejects because of misruns, we believe our experience justifies the statement that the process practically eliminates porosity.

BURNING INSTALLATION

The installation is not costly. Twelve hundred dollars would roughly represent the investment in two furnaces, the carburetor that supplies both and the stack. The power demand is to supply a one horse power motor mounted on the carburetor. The operation is very simple and without trouble. With the exception of the disk, all moving parts are enclosed in a dust-proof housing and run in grease. The fire is started in a cold furnace with a piece of newspaper and a handful of sticks or a bundle of excelsior to supply the initial ignition. After it is started and the furnace heated, ignition is continued by the retained heat and the supply of coal may be reduced. The only care required, after starting, is to keep the storage tank replenished. The supply of fuel is shut off entirely to withdraw a charge and ignition will take place after an interval of five minutes from the retained heat in the furnace. In a large operation, fuel may be supplied by gravity from an overhead bin, instead of filling the storage tank by hand.

The furnace heats quickly. A two hundred pound charge of red brass in a cold furnace can be brought to a pouring temperature in forty-five minutes and the subsequent charges in thirty minutes. With aluminum the charge can be poured in twenty minutes, starting with a cold furnace.

The factors described produce a combustion that is the essential feature of the process. Perfect combustion does not take place until the chamber is heated. That takes three to four minutes, starting with a cold furnace. Then. the volatile content of the fuel is changed to gas immediately upon entrance and burns as a gas with a flame beginning about one inch from the entrance. The fixed carbon is coked and burns as particles in suspension. The ash is melted and deposited as slag on the walls of the furnace, the exterior of the crucible and the surface of the charge. The accumulation of slag is not troublesome, as it is loose and friable and need only be removed once a week. After the chamber is fully heated, the visibility of the flame is greatly reduced and the whole interior becomes incandescent.

The experiences recited have been had with atomized coal made from an inferior grade of coal, high in ash and sulphur and averaging 12.000 B.T.U.s. It is proposed to remove the mill from Evansville, Indiana, to Cincinnati, to make a high grade of coal available and we are confident that the change of fuel will further reduce the cost of the process.

Zinc-Cadmium Alloys

"Zinc-Cadmium Alloys. A Note on Their Shear Strengths as Solders," by **R. B. Deeley.*** The material of this note forms part of an investigation, taken up by the British Motor-Cycle and Cyclecar Research Association, on the possibility of producing a satisfactory substitute for brazing spelter. The limits of the melting range were fixed by the fact that the working temperature of the substitute solder had to be below that likely to promote coarse crystallization of the hard-drawn steel tubing of the frame, and further, that the melting point must be sufficiently above the enamel stoving temperature (about 180°C.) for joints made with the alloy not to fail during the enameling process.

Tests of zinc-cadmium alloys in pure shear show the strongest alloy to be near the eutectic composition. This alloy is considerably stronger than tinman's solder, 8 tons/sq. in. of alloy in shear being an average value compared with 4 tons/sq. in. for lead-tin solder in a similar joint. At a temperature of 235°C., the alloy has a strength in shear of 48 lbs./sq. in., and at 200°C. of more than 112 lbs./sq. in.

*Abstract of a paper read before the British Institute of Metals in Glasgow, Scotland.

The Lead-Antimony System

R. S. Dean, W. E. Hudson and M. F. Fogler†

The solid solubility of antimony in lead under the conditions described varies from 2.45 per cent at the eutectic temperature to 0.80 per cent at room temperature. The solid solutions below 1 per cent antimony are quite stable at room temperature, but it is possible that over long periods even the alloy containing 0.8 per cent may break down.

Lead-antimony alloys containing antimony in excess of the amount soluble at room temperature, when quenched from elevated temperatures, subsequently age harden at room temperature as indicated by increase in tensile strength.

The increase, in conductivity during the aging or hardening process indicates that the solid solution formed at elevated temperatures is retained by quenching and subsequently breaks down by separation of a constituent in a fine state of subdivision.

†Abstract of a paper read before the American Chemical Society in Los Angeles, Cal.

The Temperature Determination of Non-Ferrous Alloys

A Paper Read at the Syracuse Meeting of the American Foundrymen's Association, October 5-9, 1925

By R. L. BINNEY,
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In recent years the casters of the non-ferrous alloys have come to realize more and more the importance of casting their metal at the proper temperatures. For a long time the only pyrometer in the foundry was the eye of the foundryman. Many old timers felt that they had an infallible gift and could accurately judge the temperatures. Many of these men valiantly fought for their principles and made it very difficult for the technical men to supplant the former methods with instruments.

There is probably no question arising in the non-ferrous foundry that is more difficult to solve properly than that of temperature measurement. Many of the instruments will give a series of readings varying from 20 to 150 degrees in the same pot of metal. The causes for these variations in readings will be explained with reference to each method. The workers who have not spent considerable time on this are often deceived, and when they realize this, they have no further use for the apparatus. It is not a simple question, but a very difficult one and is beset with many catches which, to many, have proved very discouraging.

The devices investigated were:

- Optical Pyrometers
- Radiation Pyrometers
- Temperature Cones
- Base Metal Pyrometers
  - (a) In protecting tubes
  - (b) For direct immersion
- Rare Metal Couples—Protected
- Potentiometer vs. high and low resistance meters.
- Combination of methods.

Various makes of the same device were tried and the discussion does not refer specifically to any one make. All of the pyrometers have their good as well as bad features and this paper does not condemn any one make. It is, in fact, a discussion of the temperature determination of non-ferrous alloys with melting points from 1,800 to 2,500 degrees Fahr. It must be said in justice, that several of the makers of our best standard instruments told us point blank that they had no equipment giving the necessary accuracy and did not recommend their equipment for this special problem. They were urged to develop some satisfactory outfit but evidently the commercial pressure for this particular field had not reached a sufficient magnitude.

OPTICAL PYROMETER

It was decided that if the optical pyrometer would prove satisfactory, it would present several marked advantages because there would be no thermocouples to renew, and the attention necessary would be relatively small. It was attempted to sight the instrument directly on the molten metal but this was not satisfactory, not only because there is not the black body condition but also because the surface may be covered with a thin film of slag or because the rapidly forming oxide on the surface causes false readings. A black body (graphite) was next introduced and the instrument sighted on it, but with no success. The body had to be kept at high temperature so that no time was lost in determining the reading. As the metal was poured from the furnace, slag got on the body or it crumbled or broke.

It was then attempted to fasten a graphite tube at the end of a rod with a telescope of the pyrometer fastened at the other end of it so that they were in alignment, and it would only be necessary to look through the telescope to sight directly into the tube. The tubes were to be immersed in the molten bronze to approximately the center of the pot. This was calculated to give the real temperature and not the surface reading. For a time it seemed that the method was a success but the tubes are fragile and the outfit as a whole did not seem rugged enough for foundry service and was eventually abandoned. In order to get accurate readings it was necessary to maintain a high class man, as the ordinary foundry workman failed to balance the indicator.

RADIATION PYROMETER

A radiation pyrometer was tried and its arguments appeared to be attractive. In this case the furnace operator did not have to balance the instrument but merely point the tube at the bronze and read the temperature direct. This instrument also possessed the attractive feature that there would be no thermocouples to renew and, being light, the portable apparatus appeared very convenient. Of course the instrument was unable to give correct readings or even relative ones because of the body and surface conditions of the metal. So after careful trial this one was abandoned.

SEGER CONES

In order to extend the field an entirely different principle was employed. Seger cones were introduced into the furnace by standing them on a floating body. It was thought by some that the method would be close enough but the results were of course worthless. Since the softening point of Seger cones depends on the nature of the atmosphere and especially upon the time and on the rate of heating, it is readily seen that the method would be most difficult to develop for practical foundry purposes.

BASE METAL COUPLES

Several makes of instruments employing base metal couples in protecting tubes were tried. Here the temperature may be read direct and the surface conditions caused no difficulty. The tube is immersed in the molten metal and a fairly correct temperature may be read. This, then, would appear a proper solution, but after two years this method was thrown out because of the many difficulties. In the first place the couples or rather the tubes must be kept at a high temperature in a special furnace or else the lag is too great for production work. If the tube be immersed in the metal from a fairly cold state, it takes several minutes to bring the temperature of the couple to that of the metal. This of course is impractical because of the loss of time and also because of the loss of heat, as the metal at the high temperature of molten bronze loses heat rapidly upon standing a few minutes and it is very undesirable to overheat the metal with an idea of compensating for the loss of the heat. A marked objection to this method is the fact that the protecting tubes do not last long enough. The corrosive action of molten bronze is very great and the tubes rapidly burn through. As soon as the metal penetrates to the thermo-

couple a new protecting tube must be put on which is considerable work. It is often necessary to break off the protecting tube with a sledge, and then a new thermocouple must again be insulated and the old one welded. After five years of effort, we gave up looking for a protecting tube that wouldf last long enough to warrant its use. Composition tubes (not metallic) were also tried but they were not satisfactory. Altogether the method proved not only troublesome but expensive.

It was next decided to try unprotected base metal couples. Several makes of instruments were tried as well as for the other methods discussed. Here you have the advantage of an immediate reading and it is not necessary to preheat the couple. Great care must be used to remove all slag from the surface and have it absolutely clear when the wires are immersed. Temperature determined in this way is the surface one and the metal must be thoroughly poled just before the reading is taken. In all cases there are certain difficulties which appear to the layman as easy of correction but there are, regardless of the assurances of the manufacturers, many minor troubles that vitiate the readings. The connections are always coming loose or the leads break or dirt gets into the contacts. We have tried every conceivable form of connection and have employed armored cable, but so far there has been no really reliable connection. The cold junction must be brought to the meter and the temperature of the member known, for in the foundry the meter is sometimes quite warm and again it is cold. The direct immersion method when carefully applied can give good results, but it is very easy to have two different workmen get readings varying by 100 degrees Fahr. A little surface slag will often cause a great deal of trouble. Another point against this method is that the couples burn off so rapidly and that the upkeep is high.

In all cases where thermocouples and meters were used, a method of checking was employed each day. The thermocouples are checked against a standard and the meters are checked by means of a potentiometer. It is not safe to take a chance and imagine the instrument as always correct. Sometimes is seemed as though the checking was not necessary but ever so often, we found the meters indicate false readings and have decided that the checking system is very essential.

RARE METAL COUPLES

After constant effort to overcome the trouble of determining casting temperatures, it was finally decided for furnaces other than the crucible type that some permanent installation of a rare metal couple would be of assistance. With the crucible furnace, it is possible to use a base metal couple with a protecting sheath because here the lag that is experienced in the determination of the temperature of the metal poured from a furnace is of no importance. With the larger types of furnaces, it is of marked advantage to know the temperature before the furnace has been opened. If the temperature of the metal is known as it is being brought up to heat, there is no danger of soaking it or overheating it. This not only is an advantage from a purely metallurgical viewpoint but it is likewise a saver of time and fuel. In order to accomplish this, platinum couples were embedded in the roof of the furnace and the attempt was made to find a relative value between the temperature of the metal as poured from the furnace and that indicated by the platinum couple just prior to the opening of it. Since there was a large battery of furnaces to deal with, it was attempted to have this factor the same in each case. The rare metal couples were embedded in porcelain tubes which were in turn placed in other protecting tubes, the end of which was exposed to the furnace atmosphere. The idea was to get the differential between the reading obtained by this arrangement and that obtained by immersing a couple directly in the metal. For instance, a certain furnace would give a temperature of 1500 degrees when the metal showed 2000.

It was a good idea and was partially successful but after considerable work it was decided that if the couples were embedded in the bottom of the furnace the results would be more accurate. When the door was opened the chilling effect, which was found detrimental to the atmospheric determination, would not be noticeable if the temperature was gauged from the bottom. This method is a very good one but routine control must be strictly enforced or the workmen will vitiate its virtues. In other words, if the temperature is determined, it is done so with the idea that a certain length of time elapses from the time the temperature is taken until the metal is in the pouring pot. If there are too many delays, it reduces the system to the evils of too much guesswork.

POTENTIOMETER VS. HIGH AND LOW RESISTANCE METERS

It might be well to consider the different types of instruments keeping in mind the operating conditions. The meter must be rugged, accurate and easily read. The high resistance meter is accurate and the variations in the external resistance are not so detrimental but against these points there is the delicate mechanism which constantly gets out of order in general foundry practice. We were never able to use this type meter except when it was fastened on a rigid support. This is a disadvantage as the metal must be brought to it. The low resistance meter is more rugged and when rigid stands are placed at convenient places, may be handled with safety in a foundry. This type of meter has the disadvantage that changes in the external resistance vitiate its readings and since it is necessary to change cables, this point must be watched. We had two cables (wires that connect thermopoints with meter) from the same company about the same length that gave readings differing by 80 degrees Fahr. We also found that the socket plugs used to connect the cables afforded varying resistance. When the external circuit does not vary in resistance, the low resistance meter does fairly well because it can be handled with less care, however both types have their disadvantages. The potentiometer has the advantage that the resistance of the circuit will not affect the reading. An automatic compensating potentiometer in most respects is superior to either type of meter. The greatest difficulty we have with this instrument is to quickly and correctly balance the galvanometer. The fact that it is independent of the resistance makes it possible to have one instrument with leads of varying length, hence one meter may be rigidly installed in a suitable location and connections made with various points in the foundry. This has the disadvantage of requiring two men if bare couples are used. We do not find it pratcical to move the potentiometer about, hence the single station idea.

COMBINATION OF METHODS

There are two times at which a knowledge of the temperature is important and a double system using two different methods applies. As soon as the metal in the furnace has reached the correct temperature, it should be poured as it is detrimental to the metal to soak in the furnace and costly in time and fuel to keep the furnace going after the pouring temperature is reached. The metal should be cast at a certain temperature depending no size and shape of casting, length and section of runner, etc., as this temperature affects the physical properties. To gauge the temperature in the furnace, platinum couples are imbedded in the bottom and are connected to a central potentiometer station and to determine the casting temper-

ature, and unprotected base metal couple attached to a portable meter is used. These two systems are a check on each other and of real value, however we are still looking for a more reliable and simpler method.

WRITTEN DISCUSSION

G. JENSEN, GENERAL ENGINEER, INSPECTION AND TESTING DEPARTMENT, WESTINGHOUSE ELECTRIC AND MANUFACTURING CORPORATION, EAST PITTSBURGH, PA.

The thermocouple has been accepted, generally, as the most reliable means of measuring the temperature of molten non-ferrous alloys. Whether the electromotive force set-up in the thermocouple is measured by a potentiometer or a millivoltmeter is of little importance, relatively, and certainly is not the problem. The problem has been and still is one of thermocouple design and construction.

Protection for thermocouples practically has been abandoned owing to the time lag introduced, and as a result the problem, fundamentally, has been reduced to one of kind and size of thermocouple wires. Related to this is, of course, the question of whether the wires should be joined, which in turn is determined largely by the size.

As indicated by Mr. Binney an unprotected thermocouple will give erroneous results if the active end is not kept free from slag or other foreign matter. This error may be even larger if the thermocouple wires are not connected together, owing to the possibility of a high electrical resistance existing between the wires. This is true especially if a low resistance instrument is used.

It is the writer's experience that the thermocouple wires should be small enough to permit of twisting together easily, and that a new twist should be made after each temperature determination. Using small themocouple wires not only reduces the time lag but also practically eliminates errors due to slag accumulation.

H. F. SEIFERT, ASSISTANT SUPERINTENDENT, BRASS FOUNDRY, WESTINGHOUSE ELECTRIC AND MANUFACTURING CORPORATION, EAST PITTSBURGH, PA.

I can readily appreciate that the type of instrument would present quite a problem in a small organization in so far as the maintenance of the same is concerned. For us in the electrical business this is not such a serious problem. As Mr. Jensen states, the protection for thermocouples has been practically abandoned. We have had very good success with the base metal thermocouple for direct immersion but I have often wondered myself whether or not we had the right size of wire for best results. I thought at one time that we ought to use heavier wires but other difficulties enter in that make this questionable. I am speaking right now only of the measurement of temperatures for bronzes where the wire is rather rapidly consumed. White metals present an entirely different problem, in fact, I have come to the conclusion that every alloy or group of alloys presents a special problem.

For the bearing bronzes we have found the base metal thermocouple as above mentioned very satisfactory. For the high tin bronzes it does not answer at all and we have found no satisfactory means of measuring temperatures of these alloys. Copper we pour as hot as we can get it, finding that the hotter the metal is the better is the shrinkage and freedom from blowholes. On white metals we use the open end base metal thermocouple with rather a heavy wire and find it very satisfactory. On the whole I think we have taken a decided step forward in temperature measurements in the last five years and we are making use of the developments as they come up. I am not prepared to say that we have reached the goal but the results we obtain today are much better than what we had several years ago.

Handling Materials in a Brass Foundry

A Paper Read at the Syracuse Meeting of the American Foundrymen's Association October 5-9, 1925

By T. C. FLINN

Foundry Engineer, Worthington Pump & Machinery Corporation, East Cambridge, Mass.

The question of material handling first came to the writer's serious attention because of an article appearing in the April 23, 1925, issue of The Iron Age. In this article, the statement was made that sixty tons of material were handled to produce one ton of castings.

It was quite evident to the writer that the statement, as made by the speaker, was far from representing the true condition in the average foundry and our opinion was corroborated by an article printed in the April (1925) issue of The Open Shop Review. In that issue of The Review an article appeared entitled "Handling 168 tons for every ton produced," This wide divergence of opinion from two presumably reliable sources convinced the writer than perhaps the subject of material handling had never been given the careful consideration which its importance warrants.

Governed, at first, only by a desire to determine definitely for his own enlightenment the true answer to this important question, the writer made a personal check-up of material handling in a local brass foundry and also in an iron foundry operating under average conditions. The resulting figure of 152 tons for brass and 206 tons for iron handled to produce one ton tended to further corroborate the first opinion of the writer that the 168 tons mentioned came considerably nearer representing the true conditions.

Realizing that a subject where there is such a wide divergence of opinion has perhaps been neglected to some extent and that the importance of establishing certain standards as a basis for analysis would be sure to be realized by the foundry industries the writer made brief mention of these facts to the various trade journals and from the response which he received it is quite evident that the subject of material handling is due for considerable discussion.

The analysis which follows is that of the materials handled in a brass foundry having a daily average output of 2,500 pounds of castings, which requires 152 tons of material handling to produce one ton of castings. The principles followed in making the analysis, although in this case applied directly to a brass foundry, could easily be modified to meet iron foundry conditions.

All operations in the following analysis of the handling of materials in a brass foundry start with the taking of raw materials from the storage bins of the foundry, and following the operations through the various departments and ending with the castings delivered in the shipping room ready for use of other departments or for customers.

All operations outside of the foundry have not been considered in this analysis. They would consist of the delivery of materials, coreboxes, patterns and flasks from the outside or other departments of the works.

The handling of materials, coreboxes, patterns, flasks, shovels and other equipment in the foundry is considered in this analysis which is made up in divisions generally classified by departments in the operation of a brass foundry.

The question of material handling in a brass foundry is of greater importance than many persons realize, primarily because of the close relation which material handling bears to the problem of the elimination of waste by the reduction of the amount of material handled to produce one ton of castings.

MELTING DEPARTMENT

Operations	Weight in pounds	
Metal and scrap taken from stock bins and weighed	4,700	
Delivering metal and scrap to melting furnaces	4,700	
Charging metal and scrap into melting furnaces	4,700	
Pouring metal into ladles	4,700	
Pouring metal from ladles into molds or ingots	4,700	
Total metal handled—Melting Department		23,500

COREMAKING DEPARTMENT

Operations	Weight in pounds	
Loading new sand, taken from bins into mixer	850	
Loading old sand, taken from foundry, into mixer bin	850	
Shoveling old sand, from bin, into sand mixer	850	
Emptying sand from sand mixer	1,700	
Delivering mixed sand to core benches	1,700	
Shoveling sand into coreboxes	1,700	
Turning loaded coreboxes on plates	1,700	
Setting core plates into ovens	1,700	
Removing core plates from ovens	1,700	
Delivering core plates to finishing benches	1,700	
Removing cores from core plates	1,700	
Turning over cores for pasting and blacking	1,700	
Placing finished cores in storage	1,700	
Setting finished cores along side of molds	1,700	
Placing finished cores into molds	1,700	
Delivering refuse core sand outside for disposal	850	
Total Material Handled—Coremaking Department		23,800

MOLDING DEPARTMENT

Operations		Weight in pounds	
Loading new sand from bins and delivery to foundry		500	
Spreading new sand over foundry sand heaps		500	
Gathering and dumping old sand over floor heaps		14,000	
Mixing old and new sand three times for molding		43,500	
To produce 2,500 pounds of castings daily requires 400 molds of 12 inches by 14 inches flask size. Each mold covers the following cycle in material handling.			
Putting pattern plate on machine	Lbs. 18		
Placing drag flask on pattern plate	" 27		
Filling drag flask with sand	" 17		
Peaning and strike-off sand	" ..		
Placing bottom board	" 5		
Squeeze	" ..		
Rolling over drag flask	" 67		
Removing pattern plate	" 18		
Placing drag flask on floor	" 49		
Placing pattern plate on machine	" 18		
Placing cope flask on pattern plate	" 27		
Filling cope flask with sand	" 17		
Peaning and strike-off sand	" ..		
Putting in cope board	" 5		
Squeeze	" ..		
Rolling over cope flask	" 67		
Drawing off pattern plate	" 18		
Placing cope flask on drag flask	" 44		
Placing weight on mold	" 34		
Material handled complete cycle for one mold	" 431		
Material handled—400 molds (431 lbs. each)		172,400	
Shaking out 400 molds—weight each 139 lbs.		55,600	
Delivering refuse sand outside for disposal		500	
Total Material Handled—Molding Department			287,000

CLEANING DEPARTMENT

Operations	Weight in pounds	
Removing castings, sprues and gates to gangway	4,230	
Taking castings, sprues and gates to cleaning room	4,230	
Cutting sprues and gates from castings	4,230	
Delivering sprues and gates to metal stock room	1,600	
Moving castings and putting them in sand blast	2,630	
Removing castings from sand blast	2,630	
Grinding and chipping castings	2,580	
Inspecting and counting castings	2,580	
Loading castings for delivery	2,580	
Delivering good castings to shiping room	2,500	
Delivering all metal and grinding for recovery	110	
Total Material Handled—Cleaning Department		29,900

MISCELLANEOUS MATERIAL HANDLING

(Not mentioned in the foregoing analysis)

Operations	Weight in pounds	
Equipment consisting of ladles, trucks, shovels and small tools	13,800	
Supplies, furnace linings, fluxes, core oils and sand blast sand and emery wheels	2,000	
Fuel oil used for melting and water used for foundry purposes not considered in material handling		
Total Material Handled—Miscellaneous Materials		15,800

SUMMARY OF ALL MATERIAL HANDLED DAILY TO PRODUCE 2,500 POUNDS OF CASTINGS

Department	Total Pounds Handled	Equiv. to One Ton of Castings
Melting Department	23,500	9.40 Tons
Coremaking Department	23,800	9.52 "
Molding Department	287,000	114.80 "
Cleaning Department	29,900	11.96 "
Miscellaneous	15,800	6.32 "
Total	380,000	152.00 Tons

New Nickel Iron Alloy

A good deal is likely to be heard in future of a new nickel iron alloy lately produced for the manufacture of submarine cables. The Telegraph Construction & Maintenance Company, Ltd., of London, England, has established a factory at Bilston, near Birmingham, for the manufacture of this alloy. The work was made possible by the use of the high frequency furnace. The alloy, which is called Mumetal, comprises 74 per cent of nickel, 20 per cent of iron, 5.3 per cent of copper and .7 of manganese. An alloy of this composition has a magnetic permeability of 7,000. Low hysteresis loss with a very high permeability at low magnetising forces are the characteristics chiefly required in these metals. Freedom from carbon is one of the primary essentials, and for this reason the high frequency furnace has proved the only suitable melting equipment. It has been found possible to increase the electrical resistance by introducing tungsten, chromium, silicon, vanadium, titanium, molybdenum, or aluminum in small quantities. The high frequency furnace has kept the melting free from contamination and it is claimed that the works where this is produced has more high frequency melting furnaces than any other installation. More than 5,000 miles of submarine cable loaded with these alloys are to be laid within the next few months. It is believed that the cost of submarine messages will be greatly reduced, the speed of cables increased from seven to eightfold, and some reduction should be made in the charges. The firm have at present sufficient work to keep them fully occupied for the next twelve months.—J. H.

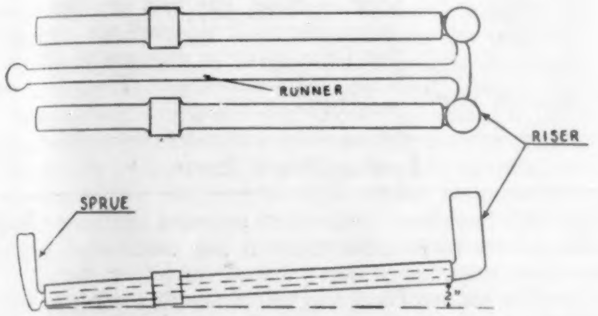
Casting Metals

Methods of Eliminating Troubles With Manganese Bronze, Nickel Alloy and Bearings

Written for The Metal Industry by W. J. REARDON, Foundry Editor

MANGANESE BRONZE VALVE STEM

Q.—We are having considerable difficulty in casting a manganese bronze valve stem. The material used is the highest grade manganese bronze and is guaranteed for 100,000 lbs. tensile strength in the pig. We have poured these both flat and on end and in either case after being machined they show air holes of about one eighth of an inch in diameter all the way through.



GATING MANGANESE BRONZE, VALVE STEM

The ones poured on end had a four inch riser balled out to about three inches in diameter. The ones poured flat were set on a slight incline and had about a three inch riser. These also showed a rough surface on the cope side. In both methods they were gated on the round end.

We prefer very much to pour these flat as we have a number to make that are about thirty inches long and it would be awkward to handle on one end. We feel that we are not pouring this metal too hot as in one instance it chilled before the last mold was poured. The second time while somewhat hoter it was not overheated, being carefully watched. In both instances the air holes showed up.

A.—We feel that your trouble is due to gates and risers, and suggest you gate as per sketch. If you have any trouble around the collar from shrinkage make a chill out of manganese bronze. Cut the chill in two. It will be necessary to put chill only in the drag. You will note from the sketch that the metal runs up hill. This contradicts a good many foundry practices, but we feel that if you carry out the instructions you will eliminate your difficulty. Pour you metal just so the zinc smokes when pushed with skinner.

HIGH ZINC BEARING

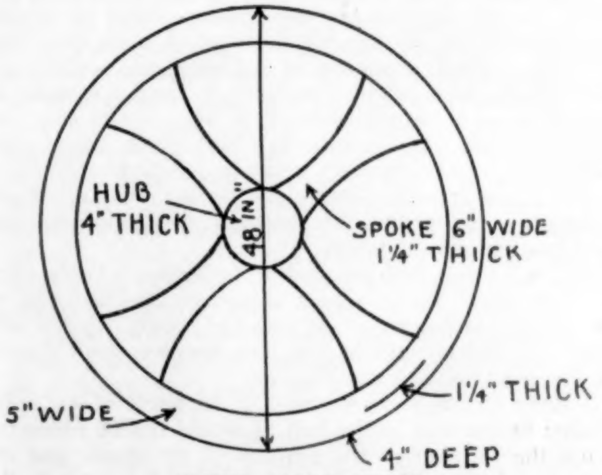
Q.—I make bushings in various sizes, using an alloy containing 84.5 per cent, zinc, 13.5 per cent No. 12 aluminum alloy and 2 per cent lead. This alloy is made up in an iron pot, poured off into ingots and then re-melted when ready to use. The bushing castings are made in iron molds, pouring with a ladle.

These castings are machined all over. After a period of six months swelling and cracking appears. I would appreciate any informaton you can give me relative to stopping this swelling and cracking.

A.—We are of the opinion that it is possible that your trouble is due to the lead in your mixture. As you know, lead and aluminum or lead and zinc do not mix very well and we would suggest you change your mixture to the following mixture: 88 per cent zinc; 8 per cent aluminum; 4 per cent copper. Use good metal. If you desire the best metal, use Horse Head zinc, and virgin aluminum and electrolytic copper. Make a hardener, 66-2/3 copper and 33 1/3 aluminum, and pour into ingots and use as follows; melt 88 per cent of zinc and add 12 per cent of hardener. This mixture is used very extensively on bushings and motor bearings and gives very good results. You can use Prime Western zinc, which is all right, but not quite as nice castings can be made from this zinc, as the Horse Head. However, for all practical purposes it will give good results. Make the hardener in a crucible.

CASTING NICKEL ALLOY

Q.—I am sending you a rough diagram of a casting we have to make and would like to know if it is possible to cast it out of our metal. We are running an alloy with 30% nickel, 46% copper and 24% zinc. It must hold its color and be free from shrinks both external and internal so it can be machined. The wheel is 4 ft. in diameter, the rim is 4" wide, 1¼ thick with a drop of 2" on one side and 1" on the other. There are 5 spokes



NICKEL ALLOY WHEEL

1" thick and 6" wide. The hub is 4" thick at the outside and 12" in diameter, but it is shouldered off on the inside to 3" then 2". The other side is flat. The spokes have a raised rib and are solid. No cores are used in the casting.

A.—This mixture will be very hard to cast. We suggest a mixture of 67½ copper, 12½ zinc, 18 niekel, .75 iron, 1 lead, .25 aluminum. This mixture will cast well and you should get good results. We suggest that you use chills on the heavy parts around the hub. You can make your shell patterns of plaster of paris and cast in aluminum bronze or manganese bronze. This makes a good chill for such metal. Also place a large riser on the hub.

POURING BEARINGS

Q.—We are making use of an alloy consisting of 52 tin, 47 lead and 1 antimony to cover 2½" diameter tinned steel shafting 6" to 14" long, about ⅜" in thickness making a finished diameter of 3-13/64".

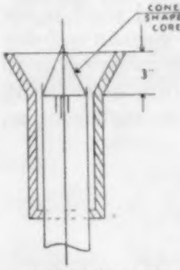
We are having no trouble pouring this metal on shafts of 6" length, but on the 10" to 14" lengths there is quite a little shrinkage of metal and consequent collapse or holes, sometimes extending down into the shaft giving us an imperfact job. In fact, we pour these 3½" diameter and expect to turn them down and find a finished, smooth roller 3-13/64". We may overcome this trouble as we find about 50% of them are fairly satisfactory.

We pour with form standing on end and have also tried the horizontal. Our requirements call for absolutely no blow holes or imperfections. Holes from shrinkage are the most of our troubles, not blowholes from air or moisture. Our form is made of seamless steel tubeing and we pour an additional length of 2" or 3" at one end which is of value on the short ones.

Would you advise adding some other kind of metal to this alloy or is there some kind of die casting non-shrinking metal which would be most suitable for our purpose? We could perhaps use a somewhat harder metal than the kind mentioned, but prefer this alloy which others are using for same purpose with satisfaction.

A.—We feel that your trouble is due to pouring temperature and suggest when pouring to get your shaft warm and pour at a temperature that will burn a pine stock. Pour in steady small stream, and use pouring cup about 3" long similar to sketch, which you will place on top of your shaft and casting. As the metal shrinks down, keep pouring into the cup until the metal in the mold stops shrinking.

From your letter your trouble is not due to the alloy, but to its remaining hot in one place, when you pour, and settling in the other parts of the casting, thus pulling from the hot part. If you will follow the above we think you will overcome the trouble. We can give you an alloy with less shrinkage that might suit your purpose, but first try the above suggestions. If this will not overcome the difficulty try a mixture of 12 lead, 9 tin and 1 antimony. This alloy has very little shrinkage.



POURING CUP

Automatic Buffing

Q.—We will appreciate any information you can give us relative to the following subject:

We use a number of automatic buffing machines. We hold our work on iron chucks held in position with a follower. While this method is absolutely sure and safe, it is nevertheless slow, because it takes considerable time to load and unload a machine. We are wondering if you know, or can give us any information about air chucks which would be suitable for the kind of work described.

We have tried spring chucks and while this works fairly successfully on straight line work it does not work on curved shapes. Furthermore it is very apt to mar and dent the work. As our work is a high grade line of commercial electric holloware it must be handled carefully so that it is not scratched inside and dented outside. When suggesting any method for chucking, this condition must be taken into consideration.

A.—Assuming that the work to be buffed is in the form of sheet metal stampings or spinnings, the majority of the designs being larger at one end, such designs will readily fit chucks such as you now use, less the follower, on the machine described below.

If these chucks were mounted at an angle of 45° with relation to the face of the buff, it would not be necessary to use the follower as the position of the chuck and the pressure of the buff would keep or hold the work to the chuck.

The spindles on which the chucks are mounted, revolve in good strong bearings with relation to the buff as it presses on the work. The work and spindles revolve with the same rotation as the buff but owing to the angular set up of the spindles, they do not revolve as fast as the buff and consequently do a fine piece of work for the reason that the lines are being continually crossed.

A machine designed on the turnstile principle, holding 4 revolving chucking arbors, angled to about 45° readily buffs stampings such as you mention.

The work passes in front of the buff during its cycle of movement on the turnstile. The turnstile is operated by a small motor and carries the work past the center of the buff and back to the operator to be replaced with a new shell. During the operation, the buff is operating on the other shells as they come in rotation. The buff soon wears to conform to the shape of the articles being buffed. The compound is fed to the buff automatically as required. Two thousand five hundred to 3,000 pieces per day can be buffed.—W. L. Abate.

Fusing Brass Parts

Q.—We have been referred to you as a company which could inform us whether there is any method of fusing brass parts together without the use of solder.

A.—We know of no way of "fusing" brass parts together, except by the use of the welding torch. This method, would of course, spoil the finish except on rough castings. To fuse metal together the parts to be connected must be melted at the juncture of the two pieces, while with soldering, to which you refer, the pieces are joined together by the solder which has a lower melting point that the brass pieces.

Your pieces might be of such shape that it would be possible to weld them with the aid of the electric spark or spot welder.—W. L. Abate.

Lead Vise Grips

Q.—What is the best form of grip or protector to use in vises to prevent injury to the work by the hard steel jaws of the vise. We have used sheet brass and copper, also zinc and in many instances they fulfil the conditions if the work is composed of smooth and hard material. When we have threaded and uneven parts to grip they become bruised.

A.—The most satisfactory form of vise grips is that of lead as it has a much wider range of usefulness. Lead is one of the softest of metals and will take the shape of work composed of almost any other metals without injury. In some districts the use of lead grips is quite common while in others they are rarely used.

The disadvantage seems to be that they are not so readily made as those of sheet metal. It is preferable to cast lead grips and with the provision of a metal mold they can be made as readily as those of any other metal.

This type of mold has the advantage of a very smooth surface and produces a good skin on the lead cast in it. The two parts of the mold can be clamped together. The lead is poured in and solidifies so quickly that the grip can be removed from the mold at once. There is practically no loss in the use of lead grips as they can be remelted and transformed into new grips in a short time.

In making such molds it is usually advisable to make the part which is to come between the vise jaws a little thicker than the part which rests on the top of the vise, to give a better cushion between the work and the vise jaws.—P. W. Blair.

Semi-Permanent Molds

A Discussion of Various Compositions and Methods of Molding

Written for The Metal Industry by EDWARD D. GLEASON, Foundryman

Due to oxidation suffered by molten metal, permanent molds, regardless of their weight have not as yet been realized. While metal molds are now being used to some extent for hot metals, it is not ideal for accurate and finished castings.

Shrinkage has more effect in a successful mold than the composition from which it is made and it is the purpose of this article to show a method of making a cheap semi-permanent mold for all metals and alloys, where accuracy and finished product can be had without depending on the resources of the skilled molder, and which can be used as many as 500 times without destroying its usefulness for the purpose; also it is comparatively light in weight.

Silica, clay and graphite constitute almost the only composition which has ever proven successful in the manufacture of crucibles, but is unsuitable for the manufacture of molds owing to its high shrinkage in burning and also owing to the fact that at high casting temperatures a reaction occurs between the graphite and the silica, producing free silicon and disintegrating the material. A few attempts have been made to employ this material for molds by first forming bricks or blocks of the same, then burning them to a permanent condition and afterwards hollowing them out by die sinking operations. This procedure results in a perfectly practicable mold, in cases where the shape of the article is sufficiently simple to enable its formation, but the expense of producing such a mold is extremely high. In a crucible material a high coefficient of heat conductivity is highly desirable, but in a mold this is a matter of very small moment. A crucible is subject to the heat of the furnace for a long time, and reaches a temperature considerably above that of the charge whereas the mold is subject to contact with the hot metal only for a short time, owing to the rapid chilling of the latter, and is always cooler than the metal. In order to secure quick and uniform heating, the walls of a crucible must be comparatively thin and the material used must be one which will afford the requisite strength at that thickness, whereas in a mold the requirements of thickness are of minor importance and the requirements of strength can be met either by reinforcement or in other ways.

COMPOSITIONS AND TREATMENT OF "PERMANENT MOLDS"

These requisites are met in the mold proper by taking equal proportions of finely pulverized firebrick and asbestos pulp and mixing them together in the dry state. In a suitable container reduce some fire clay to the consistency of cream, with water. To this gradually add the powdered asbestos and fire brick with constant stirring with a shovel and hoe to the condition of molding sand, being sufficiently worked so it will pass through a 100 mesh riddle. A mixing machine would, of course, be preferable.

If desired, instead of ramming the elements in the flasks as set forth, they can be poured over the patterns, and when set, with slight rapping, they can be lifted, the procedure being as follows. Take equal parts of asbestos pulp and silica sand of the consistency of flour and mix together in the dry state. Take 7 parts of this by measure and add 3 parts of the best Portland cement. Stir well and add sufficient water with constant working until it is like heavy molasses and then pour over the patterns (match plates). Agitate the mixture after it is poured with a heavy brush or your hands so as to remove air bubbles. It will set hard in a few hours, but not so hard but what the patterns can be lifted after slight rapping. These molds stand for a day and a night, for when set and lifted, there will be no further shrinkage and your mold will be true to pattern. Bake these molds for 8 to 10 hours at a constant heat from 800 to 1000° F., and when removed and cooled to about 100° F., immerse the cope and drag in a solution of half strength silicate of soda and water, which will permeate the mold when dried again under the heat of 200° to 300° F., and will protect and strengthen the mold so that it will stand hot metal, and keep the Portland cement from cracking.

Another method is to take 7 parts Windsor lock sand and 3 parts asbestos pulp mixed like regular sand. Ram up your pattern in the regular way, then take ½ strength silicate of soda and half water to which is added some fine graphite. Put this in an atomizer, shake it up well and spray the face of the mold so the sand is impregnated well and that the sand absorbs it. Dry this in a core oven under a mild heat or carefully with a torch so it will not blister and raise. If this job is done properly you will get a bronze casting smooth as glass, which the buff wheel will finish and which will make French sand look like 30 cents. The molds can be shaken out and wetted down and used over again like regular sand. I have seen Albany sand, mixed with asbestos pulp and used in the regular conventional way as with ordinary sand, that made brass castings look as if they had been in the acid dip.

Another composition has merit to a high degree and may be preferred by some. It is composed of 7 parts powdered soapstone and 3 parts powdered asbestos, to which is added a binder composed of 3 parts full strength silicate of soda solution and 2 parts water. This is mixed and used exactly the same as the other composition herein set forth. Soap stone has some peculiar characteristics, outside of its unctuous nature. Heat and water do not seem to affect it, for you can take a piece of the stone, heat it up, quench it in water, and repeat over and over again, and it will remain intact.

These molds can be made for the finest class of art work, including silver and gold; also the commonest kind of ordinary work, with the same procedure in their construction.

GATING PATTERNS

Fig. 1 represents a plan view of a multiple pattern, A may represent a valve, bib-cock or casting of any kind in

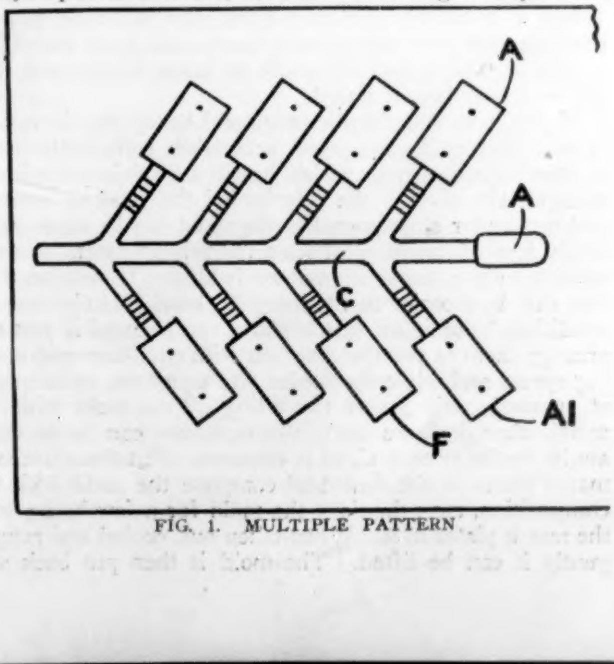
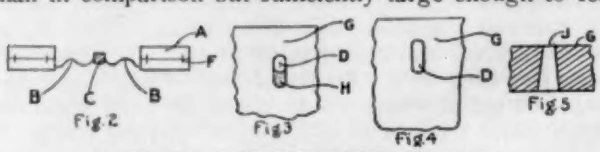


FIG. 1. MULTIPLE PATTERN

two halves held by dowels. D is the pad at the bottom of the pouring sprue, B is the gate and C the runner. It will be noted in the end view, Fig. 2, that the gate is corrugated (known as an equalizer), and the runner C and the pattern A should be heavy compared to the gate or feeder B. For, if the pattern, runner and gate have anywhere near the cross-sectional area, there will be no action, but if the pattern is heavy and likewise the runner B, being small in comparison but sufficiently large enough to feed



FIGS. 2-5. VARIOUS PARTS OF MOLD

the hot metal and fill the mold, then the mold will function in the following manner: It will be noticed in Fig. 3, which shows the cope side of the mold G, that the pouring sprue D is elongated where H represents a small body of sand and is the only sand used in the mold. This sand is rammed in by first inserting a round plug at the end opposite where the sand is to be placed. The plug should be slightly tapering as shown in Fig. 5 at J. The hot metal is poured in sprue D and not filled to overflowing. It will run down to the bottom of the mold and return to fill the mold. There will be a longitudinal shrinkage which will cause the metal, when cold, to impinge against the sand, H. The rest of the metal in the mold will be in a state of equilibrium, due to the corrugated equalizer, and nowhere in the mold will there be a pull except against the sand at H. When shaken out, the cope can be lifted off and the gate of castings taken out, and the mold will be intact.

We will now come back to our composition on the body of the mold, cope and drag. We take our metal patterns of the contour as shown in Fig. 1, which, when put on a suitable following board, I would then ram up in a fine sand mold and make some castings either from equal parts of zinc or tin, which has practically no shrinkage, or of a metal that will expand in cooling, such as 2lbs. antimony, 9 lbs. lead and 1 lb. bismuth. I would then use these for my patterns as hereafter explained. Put them on the following board of good hard wood, or metal, fill in with the composition through the riddle until patterns are covered and then add sufficient composition to fill the mold when rammed good and hard. This is, let us say, the drag side of the pattern in a metal flask. Then put the flask and the composition containing the pattern into an oven that can register 350°-400° F., leaving it for about 8 hours. Ram up the cope side of the mold and bake it similarly. When it is finished put in a blow pipe and melt out the patterns and you will have a tough and hard mold that is true to pattern and will work on brass, bronze and zinc, the results as herein stated.

If you have a hydraulic press and heavy cast iron flask or container all in one piece, with walls sufficiently heavy to stand the strain to which it will be subjected when a plunger, the size of the interior of the flask is inserted and put under slow pressure, the mold can be made practically free of moisture or least to such an extent so as to require only a small amount of baking. It will be clear that this is superior to ramming by hand. Under certain conditions, aluminum match plates can be used if you can arrange them as per the diagram with equalizer and pouring sprue, and while the feeder and equalizer, as arranged at an angle, will insure the filling of the mold with hot metal when it flows back, the equalizer can be at right angles to the runner C, as is common. Put the aluminum match plates in the flask and complete the mold with the composition, etc.; then dry the mold for a few hours with the match plates in it. When taken out, cooled and rapped gently it can be lifted. The mold is then put back and baked for about 8 hours at 350° F. It will then be dry.

I have seen concerns who were rolling gold and silver to sheet and who had trouble with blisters and pulls in the finished sheet. They were as careful as one could be to have clean metal before pouring, but they were using the old conventional open upright mold and pouring from the end. Up to the present time I have seen no other method in vogue either for steel or for the precious metals, so I designed and made a horizontal mold which overcame the trouble, and which was constructed as follows.

Referring to the Fig. 6, C-C is a plan of the mold,

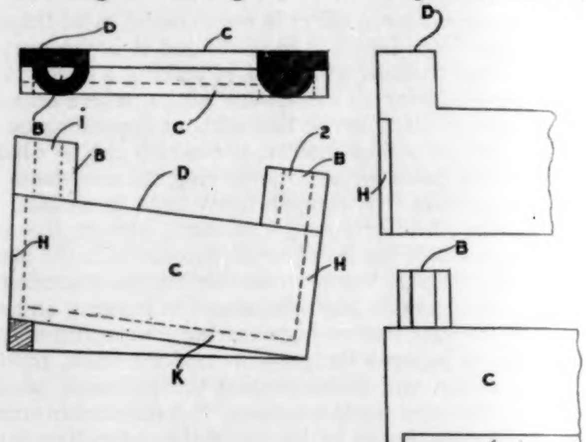


FIG. 6. DETAILS OF MOLD

where D is a side elevation; d is an extended pad or lug and B is the pouring sprue and riser. H-H are ribs between which is the side C. K is a bottom rib between the ribs H-H, so that the mold can be clamped together in any known way and is set on an incline. Metal is poured through the pouring sprue i until the mold is full. All air and dirt if any goes into the riser and feeder 2. In short the mold is on the principle of a sand mold with an extension pouring sprue i, and riser or feeder 2, and the metal in the ingot is made solid by having metal to draw from in the riser 2.

Water Tight Bronze

Q. We are at present having a lot of castings to be made that go on vacuum lines and we have used some of the valve composition but we can't get good results. So we are asking you to give us a good composition for this kind of work and a good flux.

A.—A mixture we would suggest for that class of work, is what is known as Water Tight Bronze.

85 per cent Copper; 13 per cent Tin; 1 per cent Zinc; 1 of 15 per cent Phos. Copper.

You will find this mixture very good for this class of work. The best results are obtained from this mixture on the second melt.—W. J. Reardon.

Softening Lead

Q.—Is there anything that can be added to lead to soften it? If so, what other changes does it make in the physical characteristics of the metal?

A.—There is nothing you can add to lead to make it softer. However, you can soften lead if it contains any foreign matter by poling and fixing with hosin. Melt the lead in an iron kettle. Do not get it over a dull red-heat. Take a hickory pole and insert in the lead to the bottom of the kettle and let the lead boil, care being taken not to overheat. Then take rosin and salammoniac (half and half) and spread over the surface. Pole a few minutes and skim. This will help materially in softening the lead if it contains impurities.—W. J. Reardon.

British Institute of Metals

A Report of the Autumn Meeting in Glasgow, Scotland, September 1-4, 1925

The Autumn Meeting of the Institute of Metals was held at Glasgow, Professor Turner, the president, in the chair, from September 1 to 4, and was largely attended. The meetings were held in the Rankine Hall when 16 papers were presented.

Prior to the general gathering, the fourth autumn lecture by Sir John Dewrance, K. B. E., vice-president, was given on "Education, Research and Standardization." Sir John said there were not sufficient openings for research workers and there were now 24 research associations covering most of the principal industries. The lecturer pointed out the enormous savings effected by improvements resulting from research.

At the morning meeting on Wednesday, it was announced that Sir John Dewrance had been nominated for the presidency, and the secretary G. Shaw Scott announced that the membership now reached the record number of 1,600.

At the luncheon presided over by Lord Weir, the president, Professor Turner, responding to the toast of the Institute of Metals, said that they had only to look at the aluminum indusry to see how progressive the country really was. In the past eighteen years they had the development of the aluminium industry, the motor industry and aeroplanes. They were pessimistic twenty years ago. He remembered Andrew Carnegie being asked what was the matter with Great Britain and he replied—"It is very small; that is all." There was a good deal of truth in that today.

Lord Weir also commented on the tremendous progress made in the metallurgical industry. They wanted in their political and economic development a little more of the scientific and research workers' formula—less dogma and more honest acceptance of facts.

Speaking at the reception in the evening Professor Turner said there was in no country in the world such a respectable front door as in Scotland. On the doors were knobs of brass, brilliant knockers of brass, letter boxes of brass—all of which were the products of firms connected with the Institute of Metals.

A comprehensive paper was given by **George Brinton Phillips,** Philadelphia, Pa., on **"The Primitive Copper Industry of America."** The paper was largely historical giving particulars of the numerous objects produced by Indians. He mentioned that American copper is remarkably pure, assaying to 99.90 per cent with traces of silver and iron, whereas foreign copper much more impure assayed at 98 per cent.

Another paper contributed by an American was on **"The Effect of Low Temperature Heating on the Release of Internal Stress in Brass Tubes,"** by **Robert J. Anderson,** of Pittsburgh, Pa. The writer gave the results of experiments indicating that mill control of separate lots of tubing must be substantially identical if a given heat treatment procedure is to be applied to the material. The object of the investigation was to ascertain the suitable heat treatment to prevent warping, and it was found that heating brass tubing for two or three hours at 325° C. or for four hours at 300° C. in the case of material reduced 22.4 per cent in area would materially reduce the stresses without much affecting the hardness and with practically no less in tensile strength.

A paper on **"Thermal Conductivities of Industrial Non-Ferrous Alloys,"** by **J. W. Donaldson,** dealt with high tensile brass, manganese bronze, Admiralty gunmetal, white bearing metal, from which he concluded that increasing the temperature increased the conductivities of all the alloys. Nickel lowered considerably the conductivity of an alloy.

A paper was given by **Harry Hyman** on the **"Properties of Some Aluminium Alloys."** He concluded that aluminium alloys available for sand castings for engineering purposes generally possessed low ductility which rendered them difficult to manipulate in workshop practice, and on board ship they were generally susceptible to corrosion. A series of alloys was prepared with a view to passing a minimum test of 5 tons yield point, 10 tons breaking stress, and 5 per cent elongation on sand cast test bars, and at the same time capable of undergoing the severe salt spray corrosion test without marked loss in weight. The alloy B. S. 7 containing 3% copper, 0.6% nickel, 1.75% iron, 0.1% magnesium and 0.75% silicon gave the most promising results and has been adopted on a commercial scale. Fatigue tests show the metal to be reliable under alternating stress and it can be re-melted several times without deterioration.

Among other papers was one by **Prof. J. H. Andrew** and **Robt. Hay,** on **"Colloidal Separations in Alloys; The Influence of the Time Factor on Tensile Tests Conducted at Elevated Temperatures."** The general effect of the paper was to show that there is a critical temperature condition above which the rate of application of the load has a prominent influence on the observed strength. A general examination of the results showed that the time factor tended to lose its effect when the rate of loading was kept below one ton per square inch per day.

A paper on **"The Influence of Pouring Temperature and Mould Temperature on the Properties of a Lead-Base Anti-Friction Alloy,"** by **Prof. O. W. Ellis,** of Toronto, Canada, gave the results of work carried out during the past three years in the laboratories of the department of Metallurgical Engineering of the University of Toronto. The results of this investigation are thus summarized:

1. Within the limits of the experiments recorded the replacement of lead by antimony increases the resistance of these alloys to compression. The hardness of these alloys is subject to a like increase.
2. Within the limits of these experiments the replacement of tin by copper increases the resistance of these alloys to compression. The hardness, however, is scarcely affected by the substitution.
3. Mould temperatures exert a more powerful effect on the alloys referred to in the paper than do pouring temperatures.
4. For a given temperature of mould increase in pouring temperature results in an increase in the size of the γ-cubes and in a coarsening of the matrix of the copper-free alloy.
5. Increase in pouring temperature has less effect on segregation than increase in mould temperature.
6. Increase in mould temperature causes a reduction in the resistance of these alloys to slowly applied stresses. The copper-bearing alloy has not been fully investigated in this respect.
7. Addition of copper has an important effect on the structure of these alloys.
8. There is evidence for the belief that an intermetallic reaction occurs in the copper-bearing alloy (80 lead, 15 antimony, 3.5 tin, 1.5 copper), investigated by the author in the liquid state at 334° C.

Other papers read were as follows:

"The Alpha-Phase Boundary in the Copper-Tin System," by **D. Stockdale.** In this paper the author has investigated the solubility of tin in copper. His specimens were brought into equilibrium, not by direct annealing, but by quenching from a high temperature followed by long heat treatments at the supposed temperatures of the transformations.

The shape of solidus has been modified, and it has been shown that at ordinary temperatures the solubility of tin in copper is much higher than any previous diagram indicates. It is 16.0 per cent, of tin by weight. This result need cause no concern to the makers and users of bronze bearing metals, because such material when originally cast consists of the alpha and delta phases, and the hard delta shows no tendency to dissolve in the soft alpha at low temperatures.

"The Physical Properties of the Copper-Cadmium," Alloys Rich in Cadmium," by **C. H. M. Jenkins.** The mechanical properties have been investigated on alloys containing up to 5 per cent of copper in the east, rolled and annealed states.

The effect of even a small addition of copper to cadmium is to cause the formation of a second constituent $CuCd_3$, the presence of this constituent increases the tensile strength and Brinell hardness of the alloy and prevents the grain growth of cadmium on annealing.

The Brinell hardness number increases from approximately 25 to 50 by the addition of 4.8 per cent by weight of copper for both cast and annealed alloys.

The tensile strength for cast material also rises from 5.4 to 9.8 tons/sq" with a corresponding fall in the elongation of from 52 to 0 per cent for the addition of 4.8 per cent of copper.

Annealed cadmium shows a tensile strength of 4.35 tons/sq" increasing to 9.05 tons/sq" by the addition of 2.90 per cent of copper, the corresponding elongations falling from 57 to 24 per cent.

Additions of more than 3 per cent of copper do not materially improve the mechanical properties of cadmium owing to the presence of too large a proportion of the brittle compound.

"The High Temperature-Tensile Curve: (a) Effect of Rate of Heating; (b) Tensile Curves of Some Brasses," by **Douglas H. Ingall.** Further work upon the high temperature-tensile curve of metals, obtained by subjecting annealed and cold worked wires under constant load to increasing temperature, reveals that the nature of the curve is unaffected by rates of heating varying from 3° to 20°C. per minute, but the relative position of the curve in the graph is changed.

For any given load the breaking temperature is lower the slower the rate of heating and this is most marked in the higher temperature curved portion of the curve; the critical inflection temperature is also lower the slower the rate of heating.

"The β Transformations in Copper-Zinc Alloys," by **J. L. Haughton** and **W. T. Griffiths.** With a view to determining more exactly the temperatures of the transformations which take place at about 460°C. in the β constituent of copper-zinc alloys, the change of resistivity with temperature was determined for a number of alloys containing from 46 to 63 per cent copper. Rates of heating and cooling varying from the order of 2° per hour upwards were employed. The results show that

(a) above 55 per cent copper the transformation temperature is 453°C.;

(b) between 55 per cent and 51 per cent copper it takes place at temperatures rising from 453°C. to 470°C.;

(c) with less than 51 per cent copper the transformation temperature is 470°C.

These data are opposed to the theory that this is a eutectoid transformation. A portion of the constitutional diagram of the copper-zinc alloys embodying the results obtained is reproduced.

"On the Constitution of Alloys of Aluminium, Copper and Zinc," by **D. Hanson** and **Marie L. V. Gayler.** A full description of a research undertaken: to confirm or disprove the existence of certain invariant points as found by Jares; to find the correct interpretation of the invariant reaction corresponding to the 04 point of Jares and the ternary eutectic of Houghton and Bingham; to determine the constitutional changes which take place below the solidus in alloys containing up to 25 per cent copper.

"The Effect of Temperature on the Behavior of Metals and Alloys in the Notched-Bar Impact Test," by **R. H. Greaves** and **J. A. Jones.** Notched-bar impact tests have been made on several metals and alloys at temperatures ranging from 80° to 1000°C. The B. E. S. A. standard test-piece, and the Charpy 30 kgm. machine were used.

Copper, aluminium and lead showed a continuous fall in impact figure from —80°C. to the melting point. Maxima in the impact figure-temperature curves were shown by tin at 0°, zinc at 150°, Duralumin at 400°, lead-free 70-30 brass at 800°, 60:40 brass at 715°, 10 per cent aluminium bronze at about 750°C. On the other hand, 70:30 brass containing 0.02 per cent or more of lead, and coinage bronze, showed no similar improvement in impact figure at high temperatures.

The results suggest that a high notched-bar impact figure is an indication of good rolling properties, and reveal, for many alloys, a range of temperature within which their behaviour on rolling is likely to be worse than at either higher or lower temperatures.

"On the Constitution of Zinc-Copper Alloys Containing 45 to 65 Per Cent of Copper," by **Marie L. V. Gayler.** An equilibrium diagram of zinc-copper alloys containing 45-65 per cent copper is submitted, based on the microscopic examination of well-annealed alloys. The phase field boundaries, for reasons stated, are drawn showing a slight but definite change in direction at the temperature of the β transformation point. No change in microstructure of alloys consisting wholly of the β constituent, could be detected.

"The Influence of the Time Factor on Tensile Tests Conducted at Elevated Temperatures," by **John S. Brown.** The experimental work covers a range of non-ferrous alloys; and its important feature is the demonstration of a critical temperature condition above which the rate of application of the load has a prominent influence on the observed strength. A general examination of the results suggests that this time factor tends to lose its effect when the rate of loading is kept below 1 ton per sq. in. per day, and this value is consequently put forward as of basic importance in such investigations. The experiments provide detailed graphs connecting the usual strength and the working temperature for (1) 60:40 rolled brass, (2) a phosphor-bronze turbine blading alloy, (3) rolled Monel metal, and (4) a cast aluminium; and in each instance the material has become much less attractive for use under modern conditions of super-heat, etc., than previous records would infer. The standard type of testing machine is unsuitable for such work, and a description is given of the special machine used throughout the investigation.

The Electro Deposition of Nickel

A Paper on the Comparative Value of Magnesium Sulphate vs. Sodium Sulphate, Read at the Convention of the American Electro Platers Society in Montreal, Canada, June 29-July 2, 1925.*

By CHARLES H. PROCTOR and OLIVER J. SIZELOVE

In 1920 Frank Mason, an English author, presented a paper at a Symposium on Electro-Deposition and Electro-plating at a meeting of the Faraday Society held in Sheffield, England. Mr. Mason's paper was entitled "A New Maximum Current Density in Commercial Silver Plating." Very extravagant claims were made by him for a solution that was composed of

Water	1 Litre
Silver as Metallic Silver	26.14 grams
Free KCN	47.25 grams
Potassium Carbonate	165.00 grams

An equivalent of 24 ounces of potassium carbonate per gallon of solution which the American plater is pleased to term an inert salt of no practical value.

Mr. Mason claimed a superior silver deposit from such a solution and stated that high current densities could be used that would result in a deposit of silver several times faster than was then possible with what we platers in America might term a normal silver solution with low sodium or potassium carbonate content.

This assertion by Mr. Mason created a great deal of interest. It was written up in technical journals and given much prominence in authoritative newspapers. It was written up in the American Electro-Platers Society Bulletin in January, 1921, page 7, entitled "A New Process Speeds Up Electro-Plating" and yet at the same time the American plater was interested in finding a simple way to eliminate the carbonates from his silver solution.

The symposium referred to and Mr. Mason's article was given prominence in The Metal Industry, February, 1921, issue, page 76, Vol. 19, No. 2.

One of the present writers answered Mr. Mason's contentions in an article published in The Metal Industry, March, 1921, entitled "Inert Salts in Plating Solutions. What is their maximum efficiency and when do they become a detriment?" No response was ever made to the claims in this article. Later, however, members of our own society, whom we consider as American authorities on the electro deposition of silver upon silver plated products such as hollow ware, flat ware, and substantially silver plated products in general, in a measure substantiated the claims made by Mr. Mason, the author of high carbonate silver solutions.

Just how much has been accomplished with such types of solutions we are unable to state, but we do know the American electroplater still continues to freeze out the carbonates from his silver solution or precipitates them out with barium cyanide solutions and with chloride of barium. He even resorts to boiling them out.

Not only is this statement true as regards silver solutions, but a well known member of the Society has elaborated upon the more efficient results obtained from cyanide copper bronze and brass solutions when the carbonates are maintained at a minimum basis. Several times in public utterances he has suggested the value of the separation and precipitation of the carbonate they contained in excess by the boiling process which results in their separation from the solution when the solution gets near the normal temperature.

The question at issue and yet to be determined as outlined in my paper published March, 1921, regarding inert salts is "What is their maximum of efficiency, and when do they become a detriment?"

B. Thompson of the Bureau of Standards in his valuable paper entitled "The Nickel Plating of Zinc and Zinc Base Die Castings" presented at the Forty-seventh General Meeting of the American Electrochemical Society, held at Niagara Falls, April 23rd-25th, 1925, has elaborated upon the valuable results obtained with high sodium sulphate nickel solutions, in nickel plating zinc and zinc base die castings. Mr. Thompson's paper was elaborated upon in a Letter Circular L. C. 163 April 18, 1925, covering the same subject by Dr. W. Blum, given out by the Bureau of Standards.

The decision from reading Mr. Thompson's paper and Dr. Blum's Letter Circular, is that highly concentrated sodium sulphate nickel solution is beneficial in nickel plating zinc die castings.

I believe that such solutions as outlined by Mr. Thompson with certain modifications have resulted very beneficially in nickel plating of any type of die casting, irrespective of their alloys.

At the recent Educational Session of New York Branch A.E.S., February, 1925, I gave out a formula used by one of the largest manufacturers of finished die castings in the country, and showed the finished product just as it was taken from the plating racks, as the product came from the nickel solution. The product required no final polishing to produce a final finished lustre. The lustre desired is upon the product as it comes from the bright nickel plating solution.

The solution is composed as follows:

Water	1 gallon
Single Nickel Salts	12 ozs.
Boric Acid	1½ ozs.
Anhydrous Sodium Sulphate Na_2SO_4	12 ozs.
Ammonium Chloride	2 ozs.

Brightening agent, cadmium metal sticks or cadmium chloride, as may be required. Five grains of the latter per gallon of solution is usually ample.

The pH of the solution should be equal to 5.4; the acidulating factor, hydrofluoric acid; temperature 80° F. Voltage 4 to 5; anodes electrolytic or rolled nickel 99% plus.

The samples I present to you were plated in a mechanican continuous unit, moving cathode type at amperage ranging from 10 to 25 per square foot of surface and the solution is continuously filtered during plating operations. The cleansing of die castings always presents a basic problem because the final results of the plated product depends upon a chemically clean, non-oxidized metal surface previous to plating. Electro cleaners of the mild alkali type give the most efficient results. They should always be low in caustic soda or potash content.

Electro cleaners are most effective, especially if the negative rod is so arranged with a cam movement so that it moves up and down with a vertical motion, the results will be a slushing of the articles to be cleaned by the vertical motion which will insure the removal of all buffing dirt and surface greases.

A slushing motion constantly changes the cleansing solution at the surface of the metal being cleansed, resulting in a better cleansed product.

* From the Monthly Review, July, 1925.

The vertical slushing motion can be used to an advantage in any method of cleansing when mechanical tumbling cannot be used.

Where dry cleansing with trichlorethylene, the new non-explosive solvent for greases in general, or with carbon tetra chloride, a second non-explosive solvent, or with benzol or benzine, the cleansing will be more rapid and more efficient with the slushing movement.

I recently visited the seat of the nickel plated sheet zinc industry, located at La Salle and Peru, Illinois, to investigate in a measure whether the high sodium sulphate nickel solution advocated by Mr. Thompson had been used or experimented with in the nickel plating of sheet zinc, of which carload quantities are constantly produced by the three plants in operation. Apparently no advantage has been gained from experiments made with such type of solutions.

A member of our Society in charge of the plating and finishing departments of one of the largest producers of nickel plated sheet zinc has found adverse results to those claimed for the solution of the high sodium sulfate type, and so has continued to use his own standard formula.

Another of the three firms find that they get the maximum results from a nickel solution consisting of single nickel salts, nickel chloride and boric acid. They have practically no difficulty with black streaks so prevalent in plating die castings and zinc surfaces in the past.

We can, however, rest assured that in nickel plating of die castings there is a distinct advantage in the use of anhydrous sodium sulphate Na_2SO_4 in amounts up to 12 ozs. per gallon of solution or the addition of similar amounts of magnesium sulphate ($Mg\ SO_4$) should give identical results. The deposit of nickel, however, is apparently whiter, no doubt due to the small amount of magnesium metal that possibly is deposited with the nickel. When the magnesium salt is used, on the other hand, the use of sodium sulfate produces a yellow tinge in the nickel deposit. These conclusions, however, must be further verified under actual practical working conditions, and production upon all types of basic metals, ferreous and non-ferreous, for final decision.

Some weeks ago, before leaving on a Middle West trip, I suggested to our well-known member, Oliver J. Sizelove of Newark Branch, who, as we all know, is one of the ablest electro chemists and practical electroplaters in the American Electroplaters' Society, to make a series of practical tests with magnesium and sodium sulphates solutions for the benefit of the visitors to this convention.

The suggested basic formula was as follows:

Water	1 gallon
Magnesium Sulphate $MgSO_4$	12 ozs.
Single Nickel Salts	12 ozs.
Boric Acid	2 ozs.
Ammonium Chloride	2 ozs.

Acidulating factor, pure hydrochloric acid pH 5.4

Brightening agents, cadmium chloride

Voltage as might be found desirable, amperage to be determined.

(Mr. Sizelove showed resulting samples and discussed the value of magnesium sulphate versus sodium sulphate in nickel solutions based upon formula outlined after the reading of this paper).

The use of high sodium sulphates was presumably established by Louis Schulte, a member of the Society, in his patent No. 1,379,050, dated May 24th, 1921, application filed July 24, 1918.

The formula so patented is as follows:

Water	70.9%	or 1 gallon
Sulphate of Nickel	17%	or 30 2-3 ozs.
Double Sulphate of Nickel and Ammonia	1.4%	or 2½ ozs.
Sulphate of Sodium	8.5%	or 15 1-3 ozs.
Acetic Acid	2.2%	or 4 ozs.

Mr. Schulte states that the proportions of the ingredients, however, may be varied to a considerable extent without producing any detrimental effects in the nickel deposit. The sulphate of nickel in the claims may be increased to 20%. This type of nickel solution should prove to be an excellent one for depositing nickel upon highly polished steel sheets or similar steel surfaces, the acetic acid no doubt acts as a buffer in controlling hydrogen depositions.

I am unable to determine whether Mr. Schulte's solution was patented in Canada. It was assigned to the du Pont de Nemours Corporation of Wilmington, Delaware.

In the METAL INDUSTRY for January, 1913, page 12, volume II, No. I, I published an article entitled "A Practical Nickel Solution for Plating Die Castings." In the final paragraph I mentioned "I believe that the additions of sulphate of magnesium to nickel baths of various compositions will prove more satisfactory as a conducting salt than the ammonium or chloride combinations, and that concentrated solutions can be produced that will deposit rapidly by using the single sulphate of nickel and magnesium sulphate that will enable the plater to use a greatly increased amperage upon his work, thereby reducing the time of deposit considerably without any additional cost of labor or material other than is required to produce the increased density of the solution."

D. W. Robinson, a member of the Society, mentions the value of magnesium sulphates in his excellent article on mechanical plating—Nickel Plating by the barrel process, METAL INDUSTRY, page 8, Volume XV, 1917.

Several years later I gave out a formula for a nickel electrotype solution. It was only a suggestive solution. It consisted of

Water	1 gallon
Single Nickel Salts	32 ozs.
Cobalt Chloride	4 ozs.
Magnesium Sulphate	16 ozs.
Boric Acid	2 ozs.
Acetic Acid	½ oz.

With the interesting developments in the use of high sodium sulphate solutions and their future possible value in nickel plating operations, the type of solution I mention should prove interesting.

One of our Newark, New Jersey, members has been using cobalt additions to his nickel solutions for 20 years with ideal results.

Let us determine what actual value magnesium sulphate and cobalt salts have in nickel solutions as compared with sodium sulphates. This comparison is as yet to be determined upon, and the value of high sodium sulphate nickel solutions is yet to be decided upon under actual commercial productive conditions of nickel plated product.

At the last joint meeting of the Bureau of Standards and the research committee upon electroplating, members of the society present from New England had experimented with sodium sulphates in mechanical plating barrels. They found advantages with its addition in increased throwing power, decreased internal resistance and a better nickel plated product.

I have mentioned many times that "Theory, like money, is of advantage only when it is put to work and accomplishes something."

Let us put the knowledge so gained in the use of sodium and magnesium sulphates to work and prove their commercial advantage in the nickel plating industry.

Electrochemical Society Meeting

Abstracts of Papers on Metals Read at the Chattanooga Meeting, September 24-26, 1925

Notes on the Plating of Chromium on Steel. By George M. Enos.

Steel can be chromium plated by the methods described by Schwartz, but it is recommended that the temperature of the solution be kept low.

For periods up to six hours, and temperatures up to 1,050° C., no combination of chromium plating, heat treating for diffusion, and case hardening could be found that would give surfaces which were hard, and at the same time in such physical shape as to make it likely that they would resist corrosive media. Chromium plate on steel prevents cementation for the ordinary time and temperature conditions employed in case hardening.

Some Electrical Properties of Copper-Nickel-Manganese Alloys. By Norman B. Pilling.

Temperature coefficient of resistance, specific resistance and thermo-electric power against copper were measured on thin cast rods of copper-nickel-manganese alloys, up to a maximum manganese content of 80 per cent. A wide diversity of zero temperature coefficient alloys is disclosed, which, if limited by low thermo-electric power, restricts the malleable alloys to practically two fields, potentially useful for high-grade resistance alloys. One of these fields has not been exploited. No alloys superior in thermo-electric power to 50 per cent copper-nickel appear to exist in the ternary series. Specific resistance is largely determined by the manganese content, and rises to a maximum of about 140 microhm/cm.[3] at the limit of cold workability.

The Protective Value of Nickel Plating. By C. T. Thomas and W. Blum.

Samples of sheet steel were nickel plated under various conditions of preparation and were subsequently tested in the ferricyanide, intermittent immersion, salt spray and atmospheric corrosion tests. The results indicate that all nickel coatings are porous and that the only practicable method of reducing the porosity and increasing the protective value of the nickel is by the use of relatively thick coatings, preferably not less than 0.025 mm. (0.00 in.)

A Laboratory High Frequency Vacuum Furnace. By J. R. Cain and A. A. Peterson.

A new high frequency vacuum furnace is described, which eliminates sources of contamination met with in carbon resistor type vacuum furnaces. The furnace is operated inside an evacuated bell jar; the base plate is bakelite; crucibles are made of magnesia or zircon. The melting coil and the high frequency generator are of the Ajax-Northrup design.

Static Potentials of Copper in Solutions of Copper Cyanide in Sodium Cyanide and in Potassium Cyanide and of Zinc in Solutions of Zinc Cyanide in Sodium Cyanide. By W. M. Walker, J. H. Sorrels and J. M. Breckenridge.

This paper gives a record of the data obtained in a study of the static potentials of copper in various concentrations of copper cyanide in sodium cyanide and in potassium cyanide, and of zinc in solutions of zinc cyanide in sodium cyanide. These data are given over periods of from 24 to 48 hours, with a view to studying the effects of (1) air, oxygen, and carbon dioxide when allowed to bathe the surface of the electrolyte for a period of time, (2) protective layers of oil on the surface of the electrotyte, (3) the chemical corrosion in absence of current.

Effects of Nitrates on Current Efficiency of Plating Solutions. By P. A. Nichol and O. P. Watts.

Upon the addition of 40 g. per liter of sodium nitrate to a nickel-sulfate plating bath no nickel deposit was obtained. Solutions of the nitrates of Zn, Cd, Co, Ni and Fe were tried, but no satisfactory results obtained. On the other hand Pb and Cu nitrate baths gave cathode efficiencies of 97 and 99 per cent respectively. An appreciable drop in current efficiency was obtained upon the addition of $NaNO_3$ to silver cyanide baths. In general, nitrates are to be avoided in plating baths.

Electrodeposition of Copper Nickel Alloys. By H. D. Hineline and W. B. Cooley.

Experiments were conducted in the simultaneous deposition of copper and nickel, using a bath containing fairly high concentrations of the mixed double cyanides, 50 to 150 g. per l. It was found possible to deposit coatings having a wide range of composition from almost a full copper red to a white alloy. Satisfactory anode corrosion was obtained upon adding from 5 to 40 g. per l. of KCl. The bath must be worked at a low temperature, preferably below 18° C. Very high current densities, as high as 25 amperes per sq. dm., are usable. An unusual cathodic cleansing of greasy, varnished, or rusty work was observed, due probably to hydrogen. The resulting deposit of mixed metals was found to be extremely ductile, suggesting an unusual state in the metal.

1925 Chemical Exposition

Altogether, about a dozen leading associations in the American chemical and allied industries are taking part in some feature of the Chemical Exposition at Grand Central Palace, New York, September 28-October 3, 1925. Among the speakers were a large number of the leaders in American chemistry and in associated fields. Co-operation from the U. S. Army, the U. S. Department of Agriculture and the U. S. Department of Commerce, in addition to the chemistry departments of a score of American universities, completed the representation of Chemical America at the Exposition.

Three floors at the Grand Central Palace, comprising the exhibits of some four hundred firms manufacturing chemicals, equipment, containers, instruments and many other products, made up the main body of the Exposition.

Four meetings were held at 10 o'clock in the morning of each day from Tuesday, Sept. 29, to Friday, Oct. 2, inclusive. The first three meetings were in Rumford Hall at the Chemists' Club and were devoted to a symposium on Motor Fuel and Oil Conservation. The last or fifth session of the American Chemical Society meeting was held on Friday evening, Oct. 2, at 7 P. M. at the Faculty Club, Columbia University, as an informal dinner and smoker. The speaker of this meeting was Dr. Alexander Findlay, University of Aberdeen, Scotland.

A meeting was held on Wednesday, Sept. 30th, at 2 P. M. at the Grand Central Palace. Among the papers read was "Acid Resisting Alloys Used in the Paper Industry," by Victor Hybinette.

MOTION PICTURE PROGRAM

Motion pictures were shown daily each afternoon and

evening in a special auditorium in the Grand Central Palace during the week of the Exposition. Among the films were the following:

"Copper Smelting and Brass Manufacture," (4 reels), Courtesy Anaconda Copper Mining Company.

"Ontario Graphite Mines."

"Refining, Production and Manufacture of Monel Metal," (2 reels), Courtesy International Nickel Company.

"The Story of Lead Mining and Milling," (3 reels), Courtesy U. S. Bureau of Mines.

COURT OF CHEMICAL ACHIEVEMENT

Among the new products, processes, etc., developed completely in the United States within recent years, which were shown in the Court of Chemical Achievement on the third floor of the Exposition, are the following:

New Jersey Zinc Company: Germanium Dioxide, Extremely High Purity Cadmium, Extremely High Purity Zinc.

E. I. duPont de Nemours & Company: Duco.

Bell Telephone Laboratories, Inc.: Permalloy.

Anaconda Copper Mining Company: Electrolytic White Lead, Electrolytic Zinc.

Fansteel Products Company, Inc.: Commercial manufacture of metallic Tungsten.

Ethyl Gasoline Corp.: Tetraethyl Lead.

Bakelite Corporation: Bakelite.

Chemical Treatment Company, Inc.: Crodon—a new plating alloy.

University of Chicago—Department of Chemistry: Isotopes of chlorine and mercury.

Victor Hybinette: Acid Resisting Alloy.

Arthur D. Little, Inc.: Selenium compound for flame proofing electric wires.

STUDENTS' COURSE IN CHEMICAL ENGINEERING PRACTICE

Sessions in one week course in chemical engineering fundamentals and practice, primarily for students of chemical engineering at universities and colleges, were held daily from Tuesday to Saturday mornings inclusive, beginning at 9:00 A. M. in the auditorium at the Grand Central Palace. General addresses were given each day at the opening of the session. After the general address had been delivered each day, the students separated into two groups, where the programs were conducted.

On Friday, Oct. 2, 10 to 12 A. M., lectures were delivered on:

"Heat Resisting Alloys," Arlington Bensel, Victor Hybinette, New York.

"Bakelite," T. S. Taylor, Bakelite Corp., New York.

"Lacquers as Protective Coatings," Arthur Orr, Commercial Solvents Corp., Terre Haute, Ind.

The Use of Abrasives

Written for the Metal Industry by B. H. DIVINE

I have just received your September number, and on page 370 under the heading of "The Use of Abrasives" I find comments from several concerns on the article by Mr. S. A. Cochell, which was published in your March number. I have something to add to it which might be interesting.

I obtained a sample of this "C" Gum from the concern whose name was given me by Mr. Cochell. I had it analyzed by chemists who reported as follows:

"The sample of 'C' Gum proved to be Wheat Starch with a slight amount of Coloring Matter in it.

"The jelly test showed the pure glue to be more firm than the Glue containing the 'C' Gum."

This report speaks for itself.

Having followed the use of glue in polishing for many years, I thoroughly agree with the comment by Delaney & Co., glue manufacturers of Philadelphia, that "if glue is properly used, they would not need to use any fillers." The whole story is contained in that word, "properly." The reason why people try these fillers, buy formulas, and experiment with practically any suggestion made to them, is simply because there has been no authentic or authoritative publication in existence in libraries or elsewhere, up to very recently, on the subject of handling glue for polishing. The writer has been carrying on an educational campaign as best he could, as one lone individual, to correct this condition.

I also agree with the statement in the article above referred to from "A Prominent Artificial Abrasive Company," who contradicts Mr. Cochell in his statement that glue standing over night remains satisfactory for use. It actually depreciates about 50 per cent in its holding power due to bacterial action.

Mr. Cochell's letter in your March issue was interesting, and I give him credit for endeavoring to find a way to improve his glue conditions; but, unfortunately, he struck on the wrong lines, in view of practical experience covering a wide field.

Glue makers are right, as corroborated by the writer's research and investigation, that nothing can be added to glue to increase its value, there being only one exception to this statement, and that is the use of Russian Isinglass. However, the use of this is not practical because Isinglass is too expensive.

If the users of glue in polishing work will find out just **how to use** a glue of the **right** character for polishing work, their troubles will be over.

Note: Mr. Divine, President of the Divine Brothers Company of Utica, N. Y., is one of the foremost American authorities on polishing equipment, methods and materials. He has recently written an unusually informative pamphlet entitled, "The Use and Treatment of Glue for Polishing," which was reviewed in our September issue.—Ed.

Modern Machine Tools

Among the activities designed to uphold the prestige of New England a notable event was the Annual Machine Tool Exhibition to be held at New Haven, Conn., in the Mason Laboratory of the Sheffield Scientific School on September 8, 9, 10 and 11. This was the largest exposition in the world devoted entirely to machine tools.

Among the papers read at the Technical sessions were the following:

"All Metal Airplanes," by William B. Stout, President, Stout Metal Airplane Company, Detroit, Mich.

Report of Special Research Committee on Cutting and Forming of Metals. Chairman: B. H. Blood.

"High Speed Cutting of Brass," by Luther D. Burlingame, Industrial Superintendent of the Brown and Sharpe Manufacturing Company, Providence, R. I.

It was announced that in order to insure the continuity of policies and efforts and to better protect the interest of all concerned, the New Haven Machine Tool Exhibition had been incorporated under the laws of the State of Connecticut.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

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ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

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Contents

Buyers' Guide—Advertising Page 77. Edition this month, 6,000 copies.

EDITORIAL

FOUNDRYMEN'S CONVENTION

The 29th annual convention of the American Foundrymen's Association, reported in the leading article in this issue, presented an unusually strong program of technical papers and committee reports. The problems and topics dwelt upon are among the most fundamental in the foundry industry, and papers were presented by some of the most prominent foundrymen and research workers both in the United States and abroad.

The importance of special topics was realized and adequate provision was made for discussion of these topics by having special sessions devoted to them. A session on brass foundry problems in which there was absolutely free and frank declaration of opinions, repeated the results of previous round table discussions, by being highly successful. When foundrymen get together and are allowed to pick their own topics for discussion, they go straight to practical working points. Such questions as the use of fluxes, pyrometers and methods of gating, reflect the point of view of the man on the foundry floor. He is having his day in court and making the most of it.

The laboratory man was not neglected, howecer, as the papers read before the Institute of Metals Division meeting will show.

Other problems of a more general nature, but none the less important, were taken up. Foundry refractories had a session devoted to themselves. Foundry cost accounting was stressed, and apprentice training, which is a subject of universal interest to all foundrymen, was again given special attention. In this matter of training apprentices, brass foundrymen will do well to watch reports of the gray iron and other sections, as their findings are applicable to other divisions of the foundry industry. The work of the Falk Corporation of Milwaukee is particularly noticeable in this respect. In that plant the number of apprentices has increased from 12 to 160 in five years. It is our belief that a large part of their success is due to the fact that they furnish the boy with a definite goal to aim at and keep him interested. The co-operation and interest of the parents are solicited, thus assuring the boy of greater encouragement and moral assistance.

Outstanding papers at the sessions on metals were read by D. Willcox on a New High Frequency Induction Furnace (reprinted in full in this issue); Aluminum and Aluminum Alloys in Air Craft by Samuel Daniels of McCook Field, Dayton, Ohio; Aluminum Alloy Permanent Mold Castings, by J. B. Chaffe; Notes on the Fatigue of Non-Ferrous Metals, by H. F. Moore; Endurance Properties of Non-Ferrous Metals, by D. J. McAdam, Jr.

The committees in charge of investigating sand control in the foundries have another task of great importance. The work of the American Foundrymen's Association in this branch is resulting in economies in the use of sand and proper control of the quality of castings, due to the proper use of sands.

In our last issue we ventured to predict that no foundryman could afford to miss the foundrymen's convention. It can be stated unequivocally that, after having attended this convention, we know that we were right.

PLATERS' MEMBERSHIP DRIVE

Announcement is made of a sixty-day drive by the American Electro-Platers' Society for three hundred new members. At the present time, the Society has 1,029 members and branches in twenty-two cities in the United States and Canada. Founded by Charles H. Proctor, plating-chemical editor of THE METAL INDUSTRY, the Society has grown from the very smallest beginnings to an institution of national scope and effectiveness. Its requirements are rigid and only those are eligible who are foreman platers, chemists engaged in electro-plating, or manufacturers and their representatives engaged in supplying the plating industry. The fees are low and compared to the value received from membership, they are infinitesimal. Many employers not only pay their foreman platers' dues but also pay his expenses in sending him to the conventions.

THE METAL INDUSTRY has been such an active aid and adherent of the American Electro-Platers' Society for so many years that it is hardly necessary for us to go on at great length about its merits. We are firm in the belief that no foreman plater can afford to be out of the Society, and that every manufacturer with a plating department should encourage, aid and even insist that his men join.

We offer, in all friendliness, a suggestion to the Society that additional publicity would help their cause. At the present time there is a ruling to the effect that papers read at meetings are not released for publication by the technical and business press until after they have been printed in the Monthly Review. This results often in a lapse of months before some of the papers appear. Aside from the unfairness of holding back papers from journal, which so actively support the Society, it is obvious that many more platers would be kept informed of the Society's activities if these papers were released immediately after being read, of course, with full credit to the Society. This is the practice of almost all of the prominent technical societies in the United States and abroad, and the American Electro-Platers' Society could hardly do better than to follow their example.

We wish the American Electro-Platers' Society every success in its drive and urge those of our readers engaged in the plating industry who are not already members, to join without delay.

THE SHENANDOAH DISASTER

The wreck of the airship Shenandoah has shocked the whole nation. The latest, and by all accounts, the best dirigible, lighter-than-air ship was broken up by a storm and fourteen men perished. The succession of

accidents to ships of this type has caused serious controversy even among experts as to the practicability of these ships as a means of transportation.

An investigation by the Navy Department is in progress at the present time and it is much too early to draw any conclusions. Individual opinions have given as the cause of the wreck, incorrect design, mistaken removal of safety valves and inherent structural weakness in lighter-than-air ships.

To those engaged with metals, the point of special technical interest to be watched, is the question of the suitability of Duralumin for the framework. So far no outstanding authority has stated that this metal should be discarded. Two of the officers of the detachment which salvaged the wreck, reported brittle metal in the girders near the break. Theories on the cause of such brittle metal can be expounded without end, including "metal fatigue," but so far, the knowledge of this subject is so sketchy, that it is impossible to say anything more than that this may have been one of the causes. The writer of a long communication to the New York *Times* of September 12, claims that the present alloys in use are not suitable for airships, due to their liability to corrosion and disintegration, but the references cited in favor of this comment date back to 1896, since which date so much improvement has been effected in aluminum alloys that it can hardly be accepted as authoritative.

Making every attempt to keep one's mind open on the subject and to avoid jumping at conclusions, our own impressions are that the whole science of lighter-than-air ship transportation is still very meagerly understood. It is obvious that the design is far from standard; the engines are always subject to trouble; the lifting medium, helium, although an improvement over hydrogen, in its non-inflammability, is imperfectly understood. The tragedy is that our information must be gained at the expense of the lives of the aviators.

METAL-CUTTING COSTS

The difficulty of judging the cost of a finished product is clearly shown in a paper read by L. D. Burlingame of the Brown & Sharpe Manufacturing Company at the Machine Tool Exhibition in New Haven, September 8-11, reported elsewhere in this issue. The seemingly obvious conclusion in judging the cost of a finished article is that the use of brass would make it more expensive than ordinary steel. But the fact that the raw materials in these two cases differ so widely in price is very deceptive. Results often show that brass is cheaper than steel. Brass can be machined at so much greater speed that although its cost is three times as great, this may not only be offset, but an actual saving shown. Add the fact that the salvage value of the chips is very high, the floor space required is less because the production is so much faster, and the need for fewer machines, we have a material saving in overhead and fixed charges. Moreover, longer life of the tools and the less frequent need for regrinding and setting must also be taken into consideration.

The cost of a product may be to a great extent, raw material or may be labor and overhead. Pieces which require a considerable amount of machining and finishing, fall into the latter class especially if the equipment required is expensive.

ADVERTISING AWARDS

Announcement is made of the fact that the Bok Advertising Awards governed by the Graduate School of Business Administration, Harvary University, have been opened to the business press and its advertisers. It has been requested that advertisers enter these competitions to stimulate higher standards of business paper advertising.

The awards are under four classifications.

1. For distinguished service to advertising.
2. For advertising campaigns.
3. For scientific research in advertising.
4. For distinguished individual advertisements.

Details of the above are too numerous to print, but can be obtained from the Graduate School of Business Administration, Harvard University, Cambridge, Mass. We bring this to the attention of our advertisers as we believe that competitions of this character, and this series of competitions in particular, are most beneficial to all of the industries which they touch.

TECHNICAL PAPERS

Comparative Slow Bend and Impact Notched Bar Tests on Some Metals. By S. N. Petrenko, Technologic Paper of the Bureau of Standards, No. 289.

Comparative impact and slow-bend tests on notched bars were made on some non-ferrous alloys and steels in order to determine whether the slow-bend test may be used as a substitute for, or as a useful addition to, the impact test. The tests were made in an Izod pendulum type impact machine of 120 foot-pound capacity and a Humfrey slow-bend machine of about 100 foot-pound capacity, on the cantilever beam type specimens, having 10 by 10 mm. section.

The effect of the shape of notch on the impact and on the slow-bend values was also studied. The slow-bend test gave values lower than the impact for non-ferrous materials and higher than the impact for steels.

Wherever the variation of the notched bar values is present in the specimens made of the same material, whether this variation is due to the shape of notch or to its position in respect to the rolling direction, or to the variation in the notched bar properties of a material, the slow-bend test gives results comparable with those of the impact test, but it is less responsive to these variations than the impact test. By means of a bending moment diagram the slow-bend test gives some values which are related to the tensile yield point and to the tensile strength of the materials.

It is, however, less convenient than the impact for the ordinary routine practice.

The metallographic examination has shown that the variation in the individual values of notched bar tests made on the same samples and under identical conditions can, in many cases, be directly accounted for by the structural condition of metal and by the presence of inclusions instead of being considered as test errors which are beyond the control of the operator.

An empirical formula gives the slow-bend or the impact value as a sum of two terms, one of which is proportional to the radius of the notch and the other to the square of the net thickness of the specimen.

For brittle materials the imppact and the slow-bend values are greatly affected by the radius of the notch but are little affected by the net thickness of the specimen. For tough materials the opposite is true.

GOVERNMENT PUBLICATION

Mineral Resources of the United States in 1924. By Frank J. Katz and Martha B. Clark. U. S. Geological Survey, Washington, D. C.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

GAS EVOLUTION

To the Editor of The Metal Industry:

We note on page 333 of the August issue of The Metal Industry, under the caption "Gas Evolution," a suggestion by your Mr. Proctor in answer to a question regarding cadmium plating "to add one ounce of sulphate of ammonia per gallon of solution to lower the hydrogen." Please be advised that if this suggestion is carried out, it will be a direct infringement of an invention owned by us which is covered by U. S. patent applications, Serial Nos. 742,073 and 686,898. Our claims in the above applications have been allowed and the patents are ready for issue.

The Grasselli Chemical Company.

Cleveland, Ohio,
August 15, 1925.

To the Editor of The Metal Industry:

I have no knowledge of any patent claims by any firm until the patent is issued. If the addition of sulphate of ammonia to a commercial cadmium plating solution is an infringement of a patent that has not been issued, then of course I would not be aware of that fact.

Sulphate of ammonia has been used in many plating solutions for many years for the purposes we have mentioned in the answer I submitted to the correspondent.

I would suggest that the Grasselli Chemical Company should come out with a public statement, in The Metal Industry, calling attention to its patent.

Charles H. Proctor.

New York,
September 4, 1925.

MAGNESIUM VS. SODIUM SULPHATE

To the Editor of The Metal Industry:

I have just been reading the article in Monthly Review by Mr. Proctor and Mr. Sizelove on the comparative value of magnesium sulphate versus sodium sulphate, and was impressed by some of the findings; also noticed the mention made of myself and my contribution in article written by me for The Metal Industry in February, 1917. If you will turn back to the July, 1916, number of The Metal Industry, you will find an article entitled "Magnesium Sulphate, Its Use in Nickel Plating Solutions." I gave in this article some of my experiences in the use of this material, which I believe you will find interesting, and while you probably will not agree with all of my findings, I think you will see that some of the statements made by those who have recently come to the front along this line, are in accord with what I wrote at that time.

I have also examined the table prepared by Messrs. Richards and Menninges of St. Louis Branch which is good as far as it goes but would like to have had some sort of comparison made, i. e., the work done in the test solution with varying amounts of magnesium sulphate, tested for deposit, quality, thickness, lustre, etc.

I am at present doing some work along the line of building up gradually, the content of one bath of 350 gallon capacity with magnesium sulphate, starting with 4 ozs. per gallon, and expect to keep building up and comparing work with work done in other solutions containing none of this material. Perhaps a little later I may have something to say about what results I attain with the more highly concentrated magnesium sulphate, nickel solution.

Thinking you may have forgotten or overlooked this article above mentioned, I am calling your attention to it. Any further light on the value or lack of value of magnesium sulphate, I shall be pleased to receive.

D. W. Robinson.

Ilion, N. Y.,
September 9, 1925.

To the Editor of The Metal Industry:

I wish to extend my thanks for your very interesting letter. I overlooked your article in the July, 1916, issue of The Metal Industry, but will read it just as soon as I return from a western trip. I am very much interested in the experiments you are now carrying on and only trust that you will write up your findings for publication. I am sure that a report from a thorough practical standpoint will be of much value to the plater.

I have for a long time been suggesting additions of magnesium sulphate up to 12 ozs. per gallon to both still and mechanical solutions, with gratifying results. Some firms go so far as to say that the resulting nickel deposit is more rust resistant when applied to steel than ordinary deposits from the same solution without the high magnesium sulphate additions.

I believe that a German authority (name unknown) found by continuous experiments that it was possible to deposit 2 per cent metallic magnesium with nickel deposits. If the magnesium does go over with the nickel deposit, under the nickel deposition from such magnesium sulphate solutions, then the magnesium metal might possibly have an influence in giving a more rush resistant nickel deposit upon steel. However, to maintain the magnesium content of the solution, it would be necessary to use anodes to some extent of magnesium metal.

I have used magnesium carbonate to neutralize free acid when in excess with excellent results, but the material is a great neutralizing factor so must be used with caution.

Charles H. Proctor.

New York,
September 15, 1925.

New Books

National Directory of Commodity Specifications. Published by the Bureau of Standards, Washington, D. C. 385 pages. Price, payable in advance, $1.25. For sale by Superintendent of Documents, Washington, D. C.

This directory contains in convenient form information regarding the best known specifications for more than six thousand commodities. The book tells not only what specifications are in general use but also by whom they were prepared and where copies can be obtained. In it are conveniently indexed for ready finding about 27,000 specifications prepared by the Federal Specifications Board and the separate departments of the Federal government, by state and city purchasing agents, public utilities, technical and trade associations.

The contents include: A statement and endorsement by the Advisory Board; A Foreword by Secretary Hoover, a thoroughly classified list of specifications for all types of commodities. There are also included an alphabetical list of commodities, which serves as an index to the specifications, and directions for obtaining copies of specifications listed.

The directory contains 1,700 commodities and 6,400 specifications under ores, metals and manufactures; 800 commodities and 2,900 specifications under machinery and vehicles; 600 commodities and 2,400 specifications under chemicals and allied products.

American Society for Testing Materials Standards Adopted in 1925. Published by the American Society for Testing Materials. 120 pages. Price, payable in advance, $1.50. For sale by The Metal Industry.

This publication contains the standards adopted by the society in 1925 including in all 36 revised or newly adopted standards. Among these are the following:

Standard Specifications for:

B 47-25. Round and Grooved Hard-Drawn Copper Trolley Wire.

B 55-25. Seamless 70-30 Brass Condenser Tubes and Ferrule Stock.

B 56-25. Seamless Muntz Metal Condenser Tubes and Ferrule Stock.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { WILLIAM J. REARDON, Foundry / JESSE L. JONES, Metallurgical } PETER W. BLAIR, Mechanical. WILLIAM J. PETTIS, Rolling Mill. CHARLES H. PROCTOR, Plating-Chemical. R. E. SEARCH, Exchange-Research

ARCHITECTURAL CASTINGS

Q.—Please give me an aluminum bronze mixture suitable for architectural castings.

A.—For this aluminum bronze we suggest a mixture of 90% copper and 10% aluminum. For the best results only electrolytic copper and virgin aluminum should be used.—W. J. R. Problem 3,437.

GOLD ON COPPER

Q.—Please send me information on plating copper numbers in gold to withstand weather, and not tarnish.

A.—Although gold is a non-tarnishable metal yet the sulphides in the atmosphere have a dulling action on it. Therefore, it is advisable to protect the gold plated surface with a transparent celluloid lacquer. If the gold plated copper surface is burnished by bloodstone or agate burnishers just as bright silver plated products are burnished, then the gold deposit will be more resistant to atmospheric moisture and varying weather conditions. For gold plating polished copper surfaces, the following gold solution formula can be used to advantage: Water 1 gallon; sodium cyanide 1 oz.; sodium gold cyanide ½ oz.; caustic potash ⅛ oz.; bisulphite of soda ¼ oz. Temperature 140-160 deg. F. Anodes fine gold; voltage 3 to 4.—C. H. P. Problem 3,438.

HOT GALVANIZING

Q.—We have been trying to locate text books giving information on hot galvanizing. We have secured the book by Flanders but this does not give the information we are after, and thought probably you could give us some of the information.

What we want to find out is at about what temperature spelter should be carried in a kettle to get best results for plating hardware cloth from 4 mesh to 8 mesh. By meshes we mean square spaces per inch. The wire of course must be cleaned and pickled first, and by the way, we are also anxious to learn how this can be done most satisfactorily, that is, what kind of acids to use, etc. After being cleaned and pickled this cloth enters the kettle at one end and is drawn through the spelter in a continuous process. We find where the cloth entered the kettle there forms quite a lot of material which is known as skimmings. These skimmings accumulate and sooner or later they seem to hang on to the cloth and go through the spelter coming out of the other end of the kettle showing black spots on the cloth. When trying to skim these kettles while the cloth is going through, some of the skimmings are bound to work their way on to the cloth and if we do not try to skim the kettle at this place the skimmings also get on the cloth, so you can see it is a hard proposition. We thought probably something could be used on top of the spelter at this particular place where the cloth enters the kettle that would overcome these skimmings.

Also where the cloth comes out of the kettles we use charcoal for what is known as a header or wipe. We cover the entire part of the kettle with this material where the cloth comes out. We are wondering if there is anything better for this header or wipe. Also is there anything that can be put in the spelter to make it have more fluidity?

The piece of cloth that we pass through the kettle in one operation is from 3 to 400 feet long; however, we take the skimmings off between each piece of cloth but this is not often enough to keep all of the black spots off the cloth.

A.—Hot galvanizing of hardware steel wire cloth is not treated in Flanders' Galvanizing and Tinning, an authentic standard work on this subject. There is much information, however, that you can acquire from the book.

Your proposition is a distinct one and must be treated accordingly. We presume the cloth will be galvanized in definite lengths; also will be continuous.

The greatest difficulty you will have to contend with, as you have already discovered, is the formation of dross or oxide which you term skimmings. This condition on the molten zinc can be reduced to a minimum by occasionally sprinkling the surface of the zinc with a coarse gray sal-ammoniac. In addition to the use of the sal-ammoniac, a mechanical skimmer should be arranged so that it moves from both ends of the tank containing the molten zinc towards the center of the dross that still remains; after the use of the sal-ammoniac it is kept continuously in the center of the molten zinc and it will not be picked up by the cloth either at its entrance into the molten zinc or its exit. It is necessary to use a good grade of zinc as free from lead as possible. New Jersey Horse Head zinc has been used for the purpose such as yours for nearly fifty years. The melting temperature of zinc is 786 deg. F., or 419 deg. C. You will have to increase the temperature for your purpose to about 900 deg. The temperature must be uniformly controlled by a pyrometer. Charcoal or fine coke is usually used as a wiper for wire cloth on top of the molten zinc at its exit. The addition of 1% aluminum will produce a more fluid molten zinc.

Acid pickles can best be prepared from equal parts of muriatic acid and water, heated to 120 deg. F. or from water 1 gallon; sulphuric acid 66° 12 to 16 ozs.; common salt 2 to 4 ozs. The addition of a small amount of metallic zinc, say ½ oz. per gallon, will produce a brighter surface on the wire. Possibly if some form of a vibrator could be used on the wire cloth as it exits from the molten zinc, a more uniform coat would result. We do not know of any special equipment for such a proposition as yours. It must be created.—C. H. P. Problem 3,439.

NICKEL ON STAINLESS STEEL SHEETS

Q.—I need some information on nickel plating chromium sheet steel known to the trade as stainless steel. Recently I was given a piece of this steel polished on one side only to nickel plate which plated unsatisfactorily. The nickel deposit would adhere to the back or unpolished side, but would peel and curl on the polished side while plating in the tank. I tried different voltages and amperage regulations, getting no good results. Also tried to plate in cyanide copper solution, getting same results as with the nickel peeling and curling on polished side only. The nickel solution when made up new 3 years ago consisted of the following formula. Double nickel salts, 12 ozs.; single nickel salts, 2 ozs.; sodium chloride, 2 ozs.; boric acid, 2 ozs.; to 1 gallon of water. In replenishing this solution, I use the same formula in proportion. The solution at times has a tendency to become a little high in acid due to the fact that I am using this solution to plate die castings which are high in zinc, using high voltage. The acidity I control by adding carbonate of soda. When trying to plate the sample of steel, the PH of my solution stood at about 5.8.

A.—Plating stainless steel with nickel or any other commercial metal is considerably more difficult than silver plating steel knives and forks, which has always been a problem to many platers. The cleansing of the stainless steel surface, especially when polished, requires extreme care, and possibly the strike solution should be used in connection with the plating of the metal. We suggest that the following methods be tried out.

1. Polish and electro-cleanse the stainless steel under usual conditions.

2. After cleansing, scour with a mixture composed of hydrated lime 1 part, powdered pumice stone or silica 1 part, sodium cyanide about 8 ozs. per gallon of water. Mix just enough of the cyanide solution with the lime and pumice stone to give a heavy paste, suitable for scouring. Use a regular plater's brush for scouring.

3. After cleansing and scouring, wash thoroughly in water and flash or plate in a hot nickel solution, composed as follows: Water, 1 gallon; single nickel salts, 32 ozs.; nickel chloride, 2 ozs.; ammonium chloride, 2 ozs.; boric acid, 3 oz. Temp. 120° F. Voltage 4 to 6. As the hydrogen controlling factor (as this may be

the cause of the non-adherence of the nickel deposits to the stainless steel surface), add 1/15 oz. sodium perborate per gallon of solution. The sodium perborate should be dissolved in a little warm water, 110° F. Then add just sufficient pure muriatic acid to the sodium perborate solution so that it becomes neutral or only faintly acid by the litmus paper test. Add to the nickel solution with thorough stirring.—C. H. P. Problem 3,440.

PLATING CHEMICALS

Q.—Please answer the following questions for an old subscriber. What effect have the different chemicals in plating?

Nickel salts, single and double; Epsom salts; boracic acid; sal-ammoniac; nickel chloride.

Copper and Brass: Bicarbonate of soda; sal-ammoniac; bisulphite of soda; soda ash.

Zinc: Zinc chloride.

A.—Single and Double Nickel Salts: Both of these salts are used in preparing nickel solutions, the former containing 22% nickel as metal, the latter 14% nickel as metal. The single salts are at least five times more soluble than the double nickel salts in boiling water, and is therefore used almost exclusively in building up or replenishing nickel solutions. Epsom Salts: Influence a brighter nickel deposit; also a conducting agent. Boracic Acid: A reducing agent and also a hydrogen controlling factor to some extent. It is presumed that nickel deposited under the influence of boracic acid is more malleable and ductile. Sal-ammoniac or Ammonium Chloride: Both a reducing factor and a conducting factor, due to its chlorine activity in solution. Nickel Chloride: This material gives practically the same results, but is more satisfactory to use in nickel solutions. Both the chlorine and the nickel in its combination are entirely consumed during electrolysis of the nickel plating solution, thus leaving no inert salts behind.

Copper and Brass Solution Factors. Bicarbonate of soda is a conducting agent in both solutions. Sal-ammoniac is also a conductor as well as a reducing agent for the zinc in the brass anode. It should not be used in copper solutions.—C. H. P. Problem 3,441.

PLATING CUPRO NICKEL

Q.—Is it possible to electroplate Cu-Ni alloy?

A.—You do not mention the nature of the electro-deposit you desire to plate upon a Cu-Ni alloy. Presumably it is silver. For the best results on any copper nickel alloy combination, a deposit of nickel is desirable, especially if the alloy is to be finally silver-plated. We suggest the following nickel solution to be used as the basic deposit.

Water	1 gallon
Nickel sulphate	12 avoirdupois ounces
Magnesium sulphate	12 " "
Ammonium chloride	2 " "
Boric acid	2 " "
Acetic acid	½ " "

Temperature 80° F. Voltage 4 to 5. Amperage 25 to 40 per sq. ft. of surface area. Anodes cast nickel 95-97%.

Nickel plate the Cu-Ni alloy for 5 minutes minimum for a basis for silver plating. Then follow up with the regular silver strike deposit before applying the regular silver deposit.

Silver Strike Solution.

Water	1 gallon
Sodium cyanide 96-98%	8 to 10 avoirdupois ounces
Silver cyanide	½ " "
Potassium hydroxide	½ " "

Anodes either sheet steel or carbon. Voltage 6 minimum; plate for 10 to 30 seconds. Follow up with regular silver plating solution for heavy silver deposits.

It is possible that a mercury cyanide immersion solution could be used to give to the Cu-Ni alloy surface. A film of mercury which would then enable the silver to be deposited direct without the aid of a nickel deposit or a silver strike deposit. Such a mercury solution could be prepared as follows:

Water	1 gallon
Sodium cyanide 96-98%	8 avoirdupois ounces
Mercuric chloride	⅛ to ¼ " "

or

Water	1 gallon
Ammonium chloride	32 avoirdupois ounces

Mercuric chloride as may be required to give the desired film of mercury to the surface of the Cu-Ni alloy.

Either method outlined should give satisfactory results as a basic deposit.—C. H. P. Problem 3,442.

POLISHING STEEL STAMPING

Q.—I have enclosed a polished steel stamping. We have been plating these in a still solution and buffing by hand. Can you recommend a material that would be suitable to burnish these steel stampings, in a tumbling barrel, that would give us a finish as good as the sample? We use an octagonal shaped barrel lined with hardwood. Also what speed would you recommend for the barrel while burnishing these steel stampings?

A.—It is possible to produce a very good lustre finish on nickel plated steel stampings by the ball burnishing method. We cannot state positively that the lustre will equal the sample submitted by you for our comment. That was buffed after nickel plating, by hand. We suggest that you tumble the product by the aid of soap bark using ½ oz. per gallon of water. Dissolve the soap bark in a little hot water first, then add the balance of cold water to make up a gallon or as many gallons as may be required for your purpose. Use plenty of steel balls about ⅛ or 3/16 inches in diameter. The speed of rotation of the ball burnish barrel should not be less than 50 revolutions per minute. It is speed of rotation that gives the friction to produce the burnished lustre.—C. H. P. Problem 3,443.

RAPID VS. SLOW NICKEL DEPOSITS

Q.—When electroplating a certain quantity of nickel on steel in a comparatively short time using a higher voltage compared to that of a lower voltage in a longer time, is there any difference in density of nickel? Or, in other words, which steel will best resist rusting?

A.—If you prepare a nickel solution that contains more nickel than your present solution, it is possible to carry a greater amperage per tank load of work. More amperage means more nickel deposited in a given time. Voltage is the pressure we might infer that overcomes the resistance, so with a greater amperage a somewhat higher voltage may be necessary. Some authorities claim that the density of the nickel deposit increases with higher current densities and heated nickel solutions. A nickel solution that should give excellent results and a heavy deposit of nickel in the minimum of time, can be prepared as follows:

Water	1 gallon
Magnesium sulphate	12 ozs.
Single nickel salts	16 ozs.
Boric acid	2 ozs.
Sal-ammoniac	2 ozs.
Glacial acetic acid	1 oz.

The above solution is one of the most efficient that can be used. —C. H. P. Problem 3,444.

SMELTING AUTO RADIATORS

Q.—Please let us know how the smelters handle auto radiators that are bought as junk metal. We suppose they are first sheared and then heated at low temperature to remove the solder, and balance of metal which is copper and brass all smelted together and run into ingot form. Also would like to know what kind of furnace is used in this work.

A.—Radiators are generally handled by the smelter by first sweating out the solder by placing them in sweating furnace. When all the solder that is possible to sweat out is removed, they are taken out and charged in a reverberatory furnace. When all melted down a sample is taken of the molten metal and analysis made for copper, tin, lead. The zinc is taken by the difference and enough other metal added to the furnace to make any alloy best suited from the analysis obtained from the sample, or whatever ingot metal desired, containing copper, zinc, lead and tin.—W. J. R. Problem 3,445.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,545,196. July 7, 1925. **Chromium Plating.** Harrie C. Pierce and Chad H. Humphries, Kokomo, Ind., assignors to James Clark Patten, Kokomo, Ind.

A bath for the electrodeposition of chromium containing chromic acid and relatively small proportions of hydrated chromic hydroxide and ammonium sulfate in aqueous solution.

1,545,219. July 7, 1925. **Metal-Cleaning Compound.** Médéric Vigeant, Brookline, Mass.

A metal cleaning compound comprising approximately fourteen parts sodium cyanide, two parts ammonium carbonate and one hundred and twenty-eight parts water.

1,545,234. July 7, 1925. **Alloy.** Adolph Cohn, New York, N. Y.

A manufactured alloy comprising principally platinum with ruthenium, with the ruthenium content from one-half of 1 per cent to 15 per cent of the whole.

1,545,268. July 7, 1925. **Electroplating Apparatus.** Constantine G. Miller, Chicago, Ill., assignor to The Meaker Galvanizing Company, Chicago, Ill., a corporation of Illinois.

An electroplating apparatus comprising an electroplating bath, an endless conveyor thereabove, hooks on said conveyor for supporting articles within said bath, anodes arranged in said bath, a guide for the upper portion of the conveyor, and a buss bar on which said hooks rest adapted to make knife-edge contact with said hooks.

1,545,561. July 14, 1925. **Electrodeposition of Metals.** Thomas William Stainer Hutchins, Norwich, England.

In the electrodeposition of metals, the combination with depositing vats and recuperators through which the electrolyte is adapted to be circulated, of means permitting of the overflow of eletrolyte from the said vats and its return to the recuperators without aeration, substantially as described.

1,545,838. July 14, 1925. **Nickel-Copper Alloy.** Justus W. Lehr, Baltimore, Md., assignor, by mesne assignments, to U. S. Industrial Alcohol Company, a corporation of West Virginia.

A non-corrodible alloy containing nickel 20 to 40 per cent, tin 1 to 6 per cent, and the remainder copper, and containing substantially no lead.

1,545,941. July 14, 1925. **Art of Electroplating.** Edward A. Coady, New York, and Frederic W. Olmstead, Hempstead, N. Y., assignors, by mesne assignments, to Frederick Conlin, Westfield, N. J.

An improved brush for electroplating conducting surfaces, which comprises a bristle head and an anode arranged with and surrounded by the bristles, an electrical connection to the anode, and a substantially rigid apron.

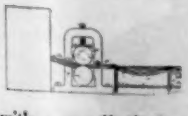
1,545,942. July 14, 1925. **Electroplating.** Frederick Conlin, Westfield, N. J.

An improved brush for electroplating conducting surfaces, comprising a handle and a bristle head adapted to retain plating solution, an anode arranged within and surrounded by the mersed in plating solution retained by the bristles, and an bristles of the bristle head whereby the anode is wholly im-electrical connection to the anode.

1,546,657. July 21, 1925. **Aluminum Alloy.** Takayasu Harada, Kyoto, Japan.

An aluminum alloy containing 0.3-6 per cent of copper, 0.5-6 percent of nickel, 0.5-6 per cent of manganese, the balance being aluminum and impurities.

1,547,877. July 28, 1925. **Method and Apparatus for Making Continuous Tin Foil.** Fred Kolb, St. Louis, Mo.



A continuous method of making tin foil which consists in forming a continuous core of suitable material, passing it through cleaning and washing liquids, immersing said core to coat it with a preliminary deposit of tin, subsequently spraying a molten tin composition on opposite sides of said core to give it the desired coating of tin, and finally passing said tin coated core through finishing rolls.

1,547,931. July 28, 1925. **Production of Ingots and Other Metal Castings.** Paul Richard Kuehnrich, Sheffield, England.

The method of producing an ingot or other metal casting in a state of virginal softness by stripping it from the mold whilst its surface or skin is still at a higher temperature than the recalescence point or critical hardening temperature of the metal concerned, immediately placing it in a container and surrounding it with heat insulating material of sufficient thickness to reduce the rate of cooling so that a period of at least 96 hours is required for the ingot or casting to become cold, substantially as specified.

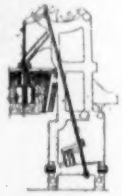
1,548,432. August 4, 1925. **Method of Electroplating Musical Instruments and Improved Eltroplated Musical Instruments.** Charles Belous, New York, N. N., assignor to C. Bruno & Son, Inc., New York, N. Y.

A method of electroplating a brass object composed of a plurality of parts soldered together, which consists in first electroplating the said instrument with nickel, then electroplating it with silver, and thereafter plating it with gold.

1,548,495. August 4, 1925, **Rust-Removing Compound.** John J. Varn Buhler, Detroit, Mich.

The metal cleaning compound comprising 24 parts by volume of raw linseed oil, 56 parts of denatured alcohol, 48 parts hydrochloric acid and 13 parts acetic acid.

1,548,602. August 4, 1925. **Casting Machine.** Charles E. Hopkins, deceased, late of Plainfield, N. J., by The Plainfield Trust Company, administrator, Plainfield, N. J.



A casting machine comprising mold members, a reservoir of molten metal, connections, including a nozzle, for conducting metal from the reservoir in communication with said connections and nozzle and located above the latter, and a pump for feeding metal through said connections and nozzle and into the auxiliary reservoir to create a head of metal.

1,548,852-1,548,853. August 11, 1925. **Process of Refining Lead.** Henry M. Schleicher, Roosevelt, and Harvey M. Burkey, Plainfield, N. J., assignors to American Metal Company, Ltd., New York, N. Y.

A method of refining lead, which comprises subjecting the molten lead to an oxidizing condition in the presence of a molten material capable of combining with oxides of the impurities present in the lead, accelerating the reaction by the addition of an alkali metal to the molten lead, and separating the molten material with the impurities from the lead.

1,548,854. August 11, 1925. **Production of Antimony.** Henry M. Schleicher, Boston, Mass, assignor to American Metal Company, Ltd., New York, N. Y.

The process of separating metallic antimony from compounds containing it, together with an alkali metal, which comprises subjecting the compound to the action of a reducing agent and treating the resulting alloy with water.

OXYACETYLENE PATENT SUIT

The **Air Reduction Sales Company** has sent letters to industrial and railway users of the oxyacetylene processes, in regard to oxygen made by a process utilizing the apparatus of the **Messer** and **Heylandt** types manufactured in Germany, informing them of a suit pending in the U. S. District Court of the District of Delaware against a user of essentially similar apparatus by reason of infringement of two patents owned by the Air Reduction Company, namely: U. S. Letters Patent No. 957170 for separation of gases from their mixtures, and U. S. Letters Patent No. 959563 for methods for the separation of gases, etc. These patents cover important inventions in the art of the separation of atmospheric air into its constituents which are used in the operation of the Messer and Heylandt columns.

The letter also calls attention to Messer and Heylandt apparatus of the so-called single rectification type (an older apparatus than that mentioned above) for the separation of atmospheric air into its constituents which is also claimed to infringe U. S. Letters Patent No. 967105.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

New Brown Recording Pyrometer

By R. P. BROWN, President, Brown Instrument Company, Philadephia, Pa.

A new recording pyrometer which combines with highest accuracy, a combination of unusually desirable features, has been developed during the past five years by the Research Department of The Brown Instrument Company, Philadelphia, Pa. Many features in the Recording Pyrometer just developed are radically new and patents have been applied for covering these improvements, some of which are listed below.

The new Brown Recorder has a die cast black enameled aluminum case. The dimensions are 15" high, 14" wide and 9" deep, requiring a minimum amount of wall space considering the unusually wide 7" chart (Fig. 1).

The instrument is built to make a single record, a duplex record with two records side by side, or in multiple form produces as many as 12 records on one chart.

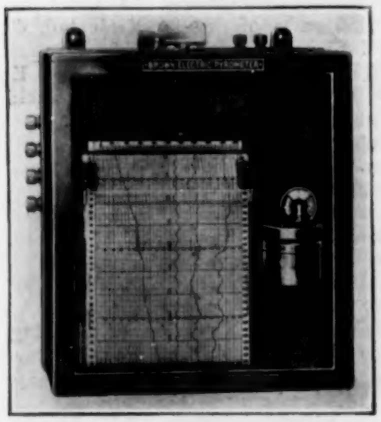


FIG. 1. NEW BROWN RECORDING PYROMETER

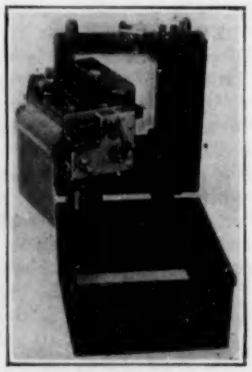


FIG. 2. RECORDER OPENED TO SHOW ASSEMBLY

It operates on the frictionless principle in which a pointer swings freely and at intervals of every thirty seconds is depressed on a carbon or inked ribbon producing a mark on the chart. These marks are so close together as to form a continuous line. The marking ribbon and chart last two months before renewal is required and no inking is necessary.

The marking ribbon is above the paper so that the mark is produced on the front side of the paper where it shows clearly. The marking ribbon in the single and duplex recorder after each mark on the chart is moved back disclosing the last impression so that the record is clearly visible immediately after it is produced.

A platen is supplied on which notes can be recorded on the chart with pen or pencil.

A glass knife edge is furnished for tearing off the paper and is located directly below the driving roll. The paper can be torn off two hours after the last impression is made. For example, a complete record for the previous 24 hours and ending 6:00 A. M. can be torn off about 8:00 A. M.

The galvanometer and the recording chart mechanism is carried on a hinged frame. When swung aside, the galvanometer is instantly accessible, and when closed a housing protects the galvanometer (Fig. 2).

In addition to recording the temperature on the chart, an indicating scale is provided with large figures legible at a considerable distance. The chart has rectangular coordinates. The time lines are straight across the chart and not curved as in others.

The recorder is driven by an electric clock if alternating current is available. The current consumed by this clock is only four watts. Six recorders only consume the current required by the common 25-watt incandescent lamp. The electric clock eliminates hand winding and no governor or other means is needed to secure accurate timing. Where alternating current is not available, a hand wound clock can be supplied.

The chart speed can readily be changed and is supplied for a number of combinations. The standard chart speed is one inch an hour but by reversing two gears a speed of four inches per hour is obtainable. Speed combinations are available from one-quarter inch an hour to six inches per hour.

With a standard chart speed of one inch per hour, about 12 hours of chart is visible through the front of the case.

The instrument as a Pyrometer incorporates automatic cold junction compensation including the Brown patented index for adjusting a compensated Pyrometer to the correct initial starting point on open circuit.

A re-roll attachment is furnished where desired to roll up the chart automatically over a long period of time.

As a Multiple Recorder, this instrument incorporates an automatic switch with gold contacts mounted on bakelite and immersed in oil, which prevents any possibility of tarnishing of the contacts from corrosive gases in the atmosphere.

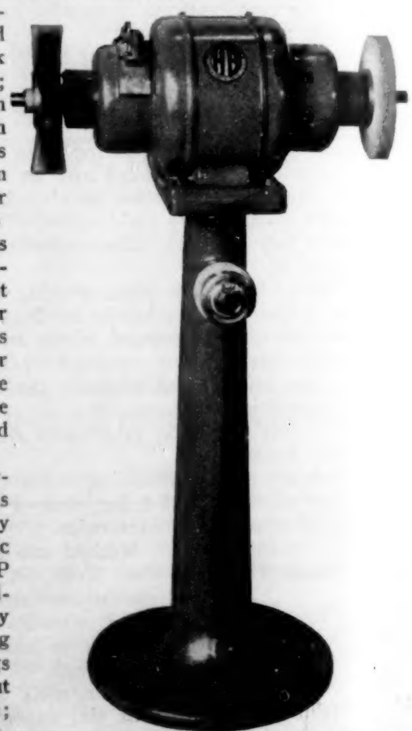
The Multiple Recorder switch includes a dial with index for indicating the number of the thermocouple or furnace which is being recorded at the time. The record lines are made in different color combinations on the chart and the switch dial is numbered and colored to correspond.

The simplicity of this instrument is claimed as one of its most marked advantages.

MOTOR BUFFER AND GRINDER

The HB ball bearing motor buffer and grinder was designed to buff tires, rims and castings, sharpen tools and polish metal parts. It is compact, can be located anywhere, and is said to cost less in the long run than a belted grinder. No line shaft to buy; no belts to break, no hangers, belting, etc.

A 1 HP non-stalling motor designed for grinding work operates this outfit; starts instantly with convenient switch in base. Ball bearings insure quiet operation and smaller power bills. Specially designed motor uses current only in proportion to load, not depending on motor rating. It connects direct to city power or light lines. The switch in the base prevents accidents and saves current.



H. B. MOTOR BUFFER AND GRINDER

The outfit is furnished complete minus grinding wheels, ready to connect to electric lines, with one HP ball bearing non-stalling motor, completely enclosed for grinding work. Ball bearings need lubrication but once in 3 or 4 months; standard shaft extension for wheels. Height of shaft from floor 45 inches, ⅝-inch diameter, length 22 inches. Speed 1800 r.p.m. Floor space required for base 15 x 15. Weight 175 lbs.

This outfit is made by Hobart Brothers, Troy, Ohio.

ONE-PIECE ELBOWS

The one-piece elbow should be familiar to every sheet metal worker. However, for those who may not be acquainted with its construction and advantages a brief description should be given.

This elbow is made out of a single piece of sheet metal, as its name implies, rolled into a cylinder and then crimped by a special machine. This crimping produces an elbow of extraordinary strength, having only a single seam to be soldered. Every elbow is perfectly round by reason of machine accuracy in making. There are no rivets used, a particular feature, for in blower work in which these elbows are specially used, it is usually the rivet-heads that wear away first, weakening the pipe and causing leaks.

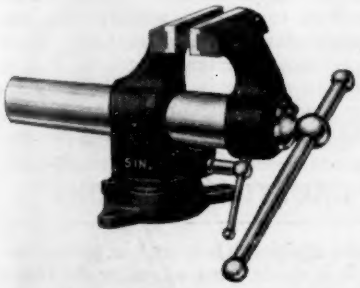
The Kirk & Blum machines are said to turn out these strong, long-wearing, perfectly-made elbows in about the time it would take a man to cut his metal to make one of the hand-made elbows. The rapidity of elbow-production on these machines brings the cost down to considerably less than that of a hand-made elbow.

S. W. Kirk of the Kirk & Blum Manufacturing Company, Cincinnati, says: "If the average sheet metal shop would check the actual cost of making elbows in labor alone, as we have done in our sheet metal department, hand-made elbows would be found to be a dead-loss in comparison with the superior quality of the machine-made product at its actually lower cost. We feel that, in securing the former Robertson patents and machines for elbow making, and producing these elbows in standard sizes at a price that is economically advantageous to the sheet metal shop, we have taken a step that is of sound benefit to the sheet metal trade."

Kirk & Blum will manufacture one-piece elbows not only for their own large requirements but for the trade in standard sizes.

KIRK & BLUM ONE-PIECE ELBOW

NEW BENCH VISE



DROPFO VISE

Under the trade name of "Dropfo," a vise that is made entirely of drop forgings, excepting only the handle, is now available.

Each part is machined to be interchangeable with the same part on any other vise of the same size. The jaw plates are knurled and forged under the hammer and doweled onto the jaw. Thus it is possible to replace the jaw plates, which are naturally subject to wear.

The Dropfo Vise is said to be lighter in weight than the old-fashioned cast iron type. It is made with a swivel base and wedge lock that is quick to set and automatic in tightening up, and has a grip that cannot shake or break loose. It is also made in the stationary type.

The Dropfo Vise is made in four sizes: 3 inch with jaws opening 5½ inches; 4 inch with jaws opening 6 inches; 5 inch with jaws opening 8 inches; and 5 inch heavy duty with jaws opening 8 inches.

Each vise is sold under a full and unconditional guarantee on each part excepting jaw plates. It is manufactured by The Fulton Drop Forge Company of Canal Fulton, Ohio.

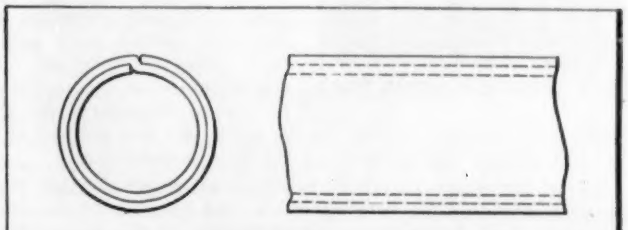
DOUBLE WALL TUBING FROM STRIP

The Bundy Tubing Company, Detroit, Mich., has developed a process and equipment for the manufacture of tubing from strip stock in copper, brass and steel. This tubing is made in sizes from ¼ to ½ inch, outside diameter, and from 32 to 18 gauge. The strip is about twice as wide as the circumference in the tubing and half as thick as the tubing wall. This stock is first completely tinned in an automatic machine, rolled into a tube, soldered, sized and cooled. The strips are formed into two complete circles, giving a double wall thickness. The subsequent sweating melts the tin and produces the effect of a single solid wall.

The strip comes in coils of from 300 to 600 feet in length. They are run through the tinning machine, and when a strip is finished, the beginning of a new strip is attached to the end of the old strip, thus making the process continuous. The material passes various spools and rollers, goes through a cleaning tank, is cleaned of the acid, and goes through the tinning bath, which is kept at a temperature of 500-550° F. by gas flames.

The tinned stock is cleaned by passing through an acid tank, the acid wiped off and then passed through six pairs of rolls, which forms the tube to about a proper dimension. After being formed, the tube goes through pre-heating pipe and then a sweating die in which the temperature is high enough to make the tin flow on all surfaces. It then passes through a series of five dies, which bring the tube to the proper outside diameter. These dies are cast iron and heated by gas flames.

With this equipment, it is stated that the work is almost entirely automatic. Tubes are said to have withstood a pressure of 25 pounds per square inch while under water. They can be bent and coiled without damage.



BUNDY DOUBLE WALL TUBE

ANODES

A slogan adopted by the Anode Corporation of America, manufacturers of nickel, copper, brass, bronze and zinc anodes, is "Anodes that Satisfy." This concern specializes in the manufacture of anodes exclusively. The foundry is at Saugerties, N. Y.

The personnel consists of R. M. Wiltbank, president; H. C. Reinhard, secretary and treasurer; E. P. Reinhard, sales manager. They have a New York office at 489 Broome street.

LONG LIVED CRUCIBLES

Crucibles should be returned to the fire just as soon as the metal is poured from them. Even after the day's work is done, if there is any way that the pot can be returned to the warm pit or the various heated pots be put closely together so that the cooling will take place as slowly as possible, better service will be secured.

This contention is being very nicely verified at The New York Brass Foundry. They use No. 45 size crucibles, gas fuel, melt red and yellow metal and 85-5-5 metal. They take off 10 to 14 heats a day—35 to 45 minutes to a heat. Their best average in years past has been 40, but then they did not take off as many heats per day.

Recently they received some No. 45 Dixon Vitrified pots. One ran 196 heats and is still good.

The second one they report as having gone 275 heats. The reason for this unusual number of heats is that so many heats per day are taken and the pot is never allowed to cool quickly but is returned to the hot furnace at night.

Of course, the conditions and the way these crucibles are handled are unusual, but it shows what remarkable heat service can be and is secured from this type of crucible in this mode of handling.

The pot should be returned to the fire as quickly as the metal is poured and to the fire after the day's work is done. It will be no trouble at all to do this in oil or gas furnaces and some sort of a scheme can be arranged to leave one or two of the grate bars in so that the pot can be cooled slowly in the hot pit.

FIG. 1—195 HEATS

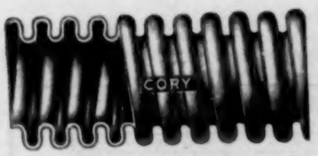
FIG. 2—275 HEATS

SEAMLESS METAL HOSE

In the years since the war, development work has been going forward in the metal hose field, one result of which is a very flexible seamless metal hose, made by corrugating either seamless bronze or seamless steel tube. For want of a more descriptive name, this corrugated tube is called a "hose," but because of the extraordinarily high pressures that it will withstand, it really is a flexible pipe. This product is made by Charles Cory & Son, Inc., New York.

There are many ways of armoring and reinforcing, but this combination of double structure allows subjecting this seamless metal pipe to pressures as high as 10,000 lbs. hydrostatic, pressures never dreamed of in the hose field before.

This hose has been put in service in over 700 plants and factories in more than 50 different applications of service, over the last six years, with not one failure due to pressure.



CORY SEAMLESS METAL HOSE

Cory engineers have worked out methods of applying fittings of standard design and thread. And, because this hose is all metal, with no interlocked packed joint packed with asbestos string or rubber composition, the high temperatures necessary in the welding or brazing process can be used. By this method only are the fittings applied to Cory seamless metal hose.

There are many places in every plant where flexible pipe connection would be very desirable, but because of the high pressure, high temperature, or character of the material to be conducted, ordinary hose could not even be considered. This is where Cory seamless metal hose, it is claimed, fills the need for a flexible hookup capable of withstanding pressures up to 10,000 lbs., temperatures as high as 1,000° F. and constant bending, as the service requires.

The life of Cory hose in any service is said to be from 5 to 10 times that of ordinary hose, and if broken by accident, such as crushing, it can be repaired by the welding process.

VALVES FOR CAUSTIC SOLUTIONS

The difficulties of stopcocks sticking when used in systems handling caustic solutions has, it is stated, been solved by the General Electric Company by the use of Genelite as a facing for the rotating part of the valve. Among the properties claimed for the material are that it never seizes or flows and that it is self-lubricating to a certain extent.

Considerable trouble was experienced with valves in the oxygen and hydrogen producing plant of the company. Valves stuck, and needed to be disassembled and sometimes destroyed after they had been used in caustic systems. Valves with Genelite facings were found to operate freely after 18 months of service. Such units can be used with practically any solution that will not attack bronze.

Genelite is a synthetic bronze, having uniformly distributed throughout its mass approximately 40 per cent by volume of very finely divided graphite. It was developed in the research laboratory of the General Electric Company a few years ago as an improved bearing alloy. Although the material has the appearance of bronze, it is machined with difficulty. It can, however, be ground easily. High pressure and heat are used in molding it.

EQUIPMENT AND SUPPLY CATALOGS

Gas Regulators. Alexander Milburn Company, Baltimore, Md.

Conveyor Applications. Cecil R. Lambert Company, Detroit, Mich.

Fan and Blower Apparatus. Garden City Fan Company, Chicago, Ill.

Screw, Nut and Stud. U. S. Electrical Tool Company, Cincinnati, Ohio.

Hydraulic Grease Gun. Shere Metal Products Corporation, New York, N. Y.

"New Method of Balance Sheet Analysis." Metropolitan Life Insurance Company, New York.

Indicating and Recording Tachometers. Catalog No. 44. Brown Instrument Company, Philadelphia, Pa.

Main Roll Drives for Copper Mills. Bulletin GEA-151. General Electric Company, Schenectady, N. Y.

Recording Pressure and Vacuum Gauges. Catalog No. 74. Brown Instrument Company, Philadelphia, Pa.

Automatic Temperature Control Instruments. Catalogue No. 87. Brown Instrument Company, Philadelphia, Pa.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

BRASS MANUFACTURERS

HEADQUARTERS, CITY HALL SQUARE BUILDING, CHICAGO, ILL.

The recent meeting of the National Association of Brass Manufacturers, held at the Hotel Hollenden, was well attended. Matters of more than ordinary importance were brought up for consideration, among the prominent things being that of the new official catalog.

Chairman Ottke of the Catalog Committee reported that the book will be arranged according to the kind of goods that are installed in the building—first, taking in what is commonly known as roughing-in goods or unfinished products—used in the basement such as ground-key, compression stop and drains, sill and sediment faucets, brass fittings and ferrules.

They will be followed with sink and tray faucets, then lavatory fixtures and nickel-plated goods of a variety of kinds as is used in up-to-date plumbing goods, the purpose being to have the various goods come along in their different forms from installation in the basement to the completion of the finest bathroom.

The first day's session was given over to the work of the Catalog Committee, while the second day to that of the various committees; namely, Standardization, Water Works Division of the Standardization Committee, the Shower & Bath Division and the Board of Trustees.

Messrs. E. F. Niedecken of Milwaukee, Wisconsin, H. N. Gillette of Cleveland, Ohio, and H. E. Speakman of Wilmington, Delaware, were appointed a special committee to supervise the cuts that will appear in the new catalog.

The quarterly report of the Credit Department showed beneficial results.

The convention approved an illustrated booklet of the right and wrong way of handling and installing plumbing brass goods which will be distributed to the master plumbers, purely as an educational matter and for them in turn to educate the house-owner. In addition, this booklet will be supplied by the members of the National Association of Brass Manufacturers to their jobbing friends and customers and will seek their co-operation in disseminating this information in the proper use and installation of plumbers' brass goods.

A vote of sympathy was extended to President Albers who was called from the convention Thursday morning, owing to the death of his mother. Letters of condolence were directed sent to Mr. Ben Klein of the United Brass Manufacturing Company of Cleveland, Ohio, for the loss of his daughter, and to Commissioner Webster, who was prevented from attending this meeting owing to a death in his family.

The Standardization Committee is looking into the advisability of adopting a 3½" china handle for bath tub fitting purposes.

A communication from Secretary S. J. Frame of the Brass Goods Manufacturers' Council of Canada, indicating that the American standards are being adopted, as well as the nomenclature adopted by the National Association of Brass Manufacturers some time ago, was read.

An associate membership in the Arbitration Foundation, Inc., of New York was ordered.

Commissioner Webster presented an interesting paper and detailed information pertaining to weights, construction and cost on one of the more popular types of lavatory faucets.

After a busy three-days' convention, which closed on Thursday, September 10th, the association decided to hold its annual meeting in New York City on December 9th and 10th, 1925.

NEW YORK BRANCH A. E. S.

HEADQUARTERS, CARE OF JOHN E. STERLING, 468 GRAND AVENUE, LONG ISLAND CITY, N. Y.

The September meetings of the New York Branch were held at the regular meeting room No. 509, World Building and were well attended.

An open meeting will be held on November 13, 1925. The feature of this meeting will be an illustrated demonstration by Dr. Skowronski on the Process of Copper Refining. This demonstration is given by courtesy of the Raritan Copper Works, Perth Amboy, N. J. Other speakers will address the meeting.

AMERICAN WELDING SOCIETY

HEADQUARTERS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, MASS.

The fall meeting of the American Welding Society will be held October 21-23, 1925, at the Massachusetts Institute of Technology, Boston, Mass. This meeting will include technical sessions, exhibitions and demonstrations, outings, and various entertainments. Information can be obtained from the Secretary at the above address.

Personals

ERNEST V. PANNELL

ERNEST V. PANNELL

Ernest V. Pannell of the British Aluminium Company was born and educated in London, England. After a preliminary period of three years spent in the study of law he attended and graduated from the engineering school of the Northampton Polytechnic in 1908. He subsequently spent three years in general engineering construction and manufacturing work including one year in Germany. One year was devoted to experimental work in the laboratories of the British Thomson Houston Company at Rugby, England. For the past fourteen years he has been associated with the British Aluminum Company, at first in making a technical study of the inherent properties of the metal as produced, and then in developing new fields for the use of aluminum and light alloys in the industrial and engineering world. In 1913 he came out to Canada and assumed duties at the Toronto office of the company. From 1916 to 1919 acted as Canadian manager. Next was assigned to duties in United States territory to assist in developing the growing field for aluminum in engineering work. The year 1922 was spent in Japan in co-operation with one of the largest rolling mills in that country to encourage and develop the fabrication of the light metal in various commercial forms. He is now located in New York engaged in sales development along engineering lines.

He has contributed articles to THE METAL INDUSTRY and other publications as well as to several societies. He was a member of the original American Institute of Metals and now belongs to the American Institute of Mining Engineers, the Society of Automotive Engineers and the American Society for Testing Materials, being a member of the A. S. T. M. sub-committee on Light Alloys.

In 1914 Mr. Pannell married Rowena Clayton, daughter of Joseph Clayton of Mayfield, England, and has a family of two sons and two daughters.

CHARLES T. BRAGG

Charles T. Bragg, consulting metallurgical engineer of Detroit, Mich., was born September 5, 1883, in Bloomington, Ind. He attended the Indianapolis public schools, the Manual Training High School of that city and in 1906 obtained a degree in chemical engineering from Purdue University. In 1907 he was a lecturer at that institution.

CHARLES T. BRAGG

Mr. Bragg was employed by the Ohio Brass Company, Mansfield, Ohio, from 1907 to 1911 in the capacity first as chemist and then as foundry superintendent. He then went to Berry Brothers, varnish manufacturers, Detroit, as technical director, remaining there until 1915. In 1915 he returned to the Ohio Brass Company as chemical engineer, remaining with them until 1918. From 1918 to 1922, he was works manager of the Michigan Smelting & Refining Company of Detroit, and from September, 1922, to February, 1923, he was president and general manager of the Michigan Valve & Foundry Company, also of Detroit, Michigan.

In these institutions his experience covered the development, manufacture and sale of varnishes, japans, enamels, shellac, finished brass products, ingots, babbitts, solders, copper rail bonds, etc.

Since 1923 Mr. Bragg has practiced as a consulting engineer, with headquarters in Detroit. He is registered under the Michigan laws as a chemical engineer and can practice also as a mechanical engineer.

He is a member of a number of technical societies, among which are the American Chemical Society, Institute of Metals Division, American Institute of Chemical Engineers, American Electrochemical Society, American Foundrymen's Association and American Society for Testing Materials. He has been an officer of the national and local sections of many of these societies. He is a member and officer of a number of civic organizations and committees of Detroit, and a major in the United States Army, Chemical Warfare Service.

Frederick Breitenfeld, counselor at law in patent causes, announces the removal of his office to 342 Madison avenue, New York City.

R. R. Clarke, General Electric Company, Erie, Pa., on Monday evening, September 21, discussed informally before the Pittsburgh Foundrymen's Association, "The Foundry Physicist," giving a talk of a most practical nature and illustrated with examples direct from experience.

R. P. Titus has resigned as vice-president of the Liberty Central Trust Company of St. Louis, the second oldest banking institution in Missouri and one of the largest in the Middle West. He has joined the Magnus Chemical Company of Brooklyn, manufacturers of Magnus Cleaners and of Dif.

Louis J. Jenner of Springfield, Mass., has joined the staff of the General Abrasive Company, Inc., Niagara Falls, N. Y., to sell and demonstrate Lionite, an artificial aluminous abrasive. Mr. Jenner has had many years practical polishing experience, is a member of the American Electro-Platers' Society and enjoys a wide circle of acquaintances in the metal polishing trade.

L. M. Zimmer has been appointed general sales manager of the Linde Air Products Company, manufacturers of oxygen, and of the welding gas division of The Prest-O-Lite Company, Inc., manufacturers of dissolved acetylene, succeeding L. M. Moyer, who resigned August 1, 1925. Mr. Zimmer entered the employ of The Linde Company nine years ago as junior salesman, and has steadily risen in rank. Most of the time he has represented the company in the Central West, coming to New York early in 1924 to act as assistant general sales manager.

Obituaries

HENRY HODECKER

Henry Hodecker, senior member of Hodecker Brothers, Newark, N. J., died July 18, 1925.

EDWIN SMEETH

On August 29, 1925, Edwin Smeeth, aged 63, president of the Smeeth-Harwood Company, Chicago, brass founders, died at his home in Oak Park, Ill.

EDWIN T. PETERS

Edwin T. Peters, a department superintendent at the Stamford Rolling Mills, Stamford, Conn., died suddenly at Stamford recently of acute indigestion while in his automobile. He was fifty-two years old and left a widow and son, Donald, a student at Lafayette.

WILLIAM G. HOLLAND

William G. Holland died recently at the age of 61. For the last twenty-five years Mr. Holland was connected with the Langsenkamp-Wheeler Brass Works, Indianapolis, Ind. He was a lifelong resident of the above city, and for many years was secretary of the Indianapolis Excelsior Machine Company, makers of special machinery.

JOSEPH MITCHELL

Joseph Mitchell, president, John Williams, Inc., iron works and bronze manufacturer, Plainfield, N. J., died at his home in that city on September 5, 1925. Except for a brief period in his youth, Mr. Mitchell had spent his entire life with the firm of which he was head. He was formerly a member of the board of governors of the Building Trades Employers' Association, New York.

ALEXANDER MATHES

Alexander Mathes, treasurer General Metals Refining Company and its subsidiary, the G. Mathes Company, St. Louis, Mo., died at the Baptist Sanitarium in that city on August 17, after an illness of a year. Mr. Mathes was 58 years old. He went to St. Louis more than forty years ago with his widowed mother and three brothers, where they founded the G. Mathes Company, which was named for his mother.

ROBERT H. ENGLE

Robert H. Engle, 64 years old, of 709 Hamilton avenue, Trenton, N. J., died at his home on September 9, 1925, after an illness of five months. Mr. Engle was a prominent authority on zinc products and was president of the United Zinc Smelting Corporation. He was also an inventor, having taken out several patents. He was born at Medford, N. J., and had been a resident of Trenton for 21 years. He was a pioneer zinc manufacturer of the country and the organizer of the Trenton Smelting and Refining Company, Trenton, N. J. For 25 years he was president of the United Lead Company, of Philadelphia. He was also a member of various chemical societies.

The deceased is survived by his widow, Mrs. Rosina Vollmer Engle; a son, Alan L. Engle, of Trenton, and one daughter, Mrs. Moore B. Reynolds, of Clarksburg, W. Va.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

October 1, 1925.

A policy of gradual elimination of stream pollution based on the best available methods which will work the least harm to the industries of the state has been announced by the new state anti-pollution commission, created by the last legislature. The first step of the commission to clean up the waters of the state will be made in Waterbury and surrounding territory, it is said. The Naugatuck river is claimed to be the worst polluted stream in the state because of the thousands of factories which empty into it all along the Naugatuck valley and chiefly in Waterbury.

Industrial wastes, such as the local plants empty into the Waterbury is the source of pollution to which the commission will first turn its activities rather than municipal sewage. The industrial wastes consist of chemical and waste products of an acid or alkaline nature which is very destructive to all plant and animal life. It is often difficult, the commission states, to correct or make harmless these wastes without imposing a heavy burden of expense upon an established industry which is forced to compete with industries of a similar character in other states where pollution is unchecked.

Figures compiled by the Chamber of Commerce show that there has been a decided increase in employment in the local factories during the past month and there were more men employed in August than in July. The Chamber states that while there has been no great boom, industrial conditions are better now than they have been in any month, this year.

Otto Voght, of Thomaston, has purchased the plant of the **Arrow Crystal and Dial Company,** in this city, which manufactures door plates, electric range dials, watch dials and crystals, and also gas machine dials.

Income tax figures, made public, last month, showed that the **Waterbury Clock Company** paid the highest tax of any concern in the city, $144,871; the **Connecticut Light and Power Company** next with $140,872; the **Scovill Manufacturing Company** third, with $127,030, and the **Chase Companies** fourth, with a tax of $112,908. **Irving H. Chase,** of the Waterbury Clock Company and the Chase Companies, paid the highest tax of any in Waterbury, $41,298; and **Mrs. Henry S. Chase,** widow of the former president of the Chase Companies, paid the second highest. **E. O. Goss,** president of the Scovill company, **John H. Goss,** its vice-president, **John A. Coe,** president of the American Brass Company, **Fred S. Chase,** president of the Chase Companies, and **George Goss,** of the Scovill company, ranked among the highest tax payers of the city.

Stockholders of the **Anaconda Copper Mining Company,** of which the **American Brass Company** of this city is a part, have received reports that the company earned its whole year's dividend requirements of $3 a share in the half year, after depreciation, taxes and bond interest. Earnings for the second half are expected to be somewhat higher than for the first half-year.

The **Chase Companies,** the **Blake & Johnson Company** and the **Hendley Machine Company,** the latter of Torrington, have been invited to send representatives to a convention of machinery manufacturers to be held in Washington, this month, under the auspices of the Department of Commerce. Proposals for the elimination of 459,000 sizes and types of grinding wheels now carried in stock will be offered for adoption by a general conference.

A. H. Wells & Sons, manufacturers of brass rods, wire and tubes, have started construction of a one-story brick and steel factory building to cost $38,500. The building is on the south side of East Aurora street adjoining the east plant of the company. The new building will be used as a tube mill. The Clark Construction company has charge of the building which was designed by **George E. Wells.**

Fire caused a damage of $20,000 to the plant of the **Universal Pin Company** on Jefferson street, Sept. 5. The **Hartley Wire Die Company,** adjoining, was also considerably damaged by the fire. Water caused as much damage as fire because many of the machines of both companies are of a particularly delicate nature and were flooded by the water. Both plants were obliged to close for several weeks for repairs.—W. R. B.

BRIDGEPORT, CONN.

October 1, 1925.

The **Bridgeport Brass Company** has filed a new appeal from the tax assessment of 1920 which it paid in 1921 under an agreement with the then Tax Commissioner Arthur F. Connor, who had issued a certificate of error that a mistake had been made in the assessment of buildings and who lowered the assessment on the buildings, $120,000.

The new tax commissioner brought suit to compel collection of the tax on the old assessment and after being carried to the State Supreme Court, it was ruled by that court that there was no warrant for the tax commissioner to issue a certificate of error and as the tax had been paid for that year the company lost its right of appeal. The new appeal of the company is taken under the so-called "Ripper" Bill, passed by the last legislature, which takes the taxing powers away from the city and lodges them with the state. This provides that corporations may apply to the superior court for relief from inequitable assessments.

A. D. Guion, advertising manager of the **Bridgeport Brass Company,** was the speaker at the noonday luncheon of the Advertising Club, at the Stratfield, Sept. 9th, telling the members how to advertise brass. The various styles of copy used in advertising brass were explained by Mr. Guion and he illustrated his talk with mounted specimens of various series of advertisements used, such as "The History of Sugar," "The History of Plumbing," bringing out in each of these the advantages of using brass as well as the romance connected with its use.

C. A. Willard, secretary of the Industrial Bureau, has announced another new industry for Bridgeport. The head of the concern is **L. Lederman,** manufacturer of watch crystals, with manufacturing space now in New York city. Mr. Lederman has leased the top floor of the factory building at 209 Center street, formerly the property of the Bridgeport Elastic Fabric Company. The term of the lease is for five years. Mr. Lederman is an expert Swiss watch crystal manufacturer, having been in business in this country only three years and in that time built up a business that has been continually expanding and is obliged to secure new quarters. At the start about 25 hands will be employed. The company specializes in fancy watch crystals of various odd shapes and sizes.

De Ver H. Warner, president of the **Warner Brothers Corset Company, Walter B. Lashar,** of the **American Chain Company,** and **Mr.** and **Mrs. Waldo C. Bryant,** the former president of the **Bryant Electric Company,** head the list of the largest income tax payers of Bridgeport.

The real estate and equipment of the **British American Manufacturing Company,** of Stamford, was sold at auction last month by order of the United States District Court to Frank M. Robertson, a lawyer of 111 Broadway, New York. The purchase price was $175,000. There are eight acres of land and several factory buildings.

James Kemp Fox, of Fairfield, a member of the sales force of the **Bridgeport Brass Company,** was married to **Eileen Collins,** daughter of **Mr.** and **Mrs. George L. Collins,** of Detroit, Sept. 4. He was formerly a member of the advertising department of the brass company—W. R. B.

TORRINGTON, CONN.

October, 1, 1925.

The **Torrington Specialty Company** has awarded the contract for a factory building of brick construction, 60 x 40 feet, one story high, on Winsted road. The construction will be such as to permit of an addition later on. The Torrington Building Company has the contract. The Torrington Specialty Company manufactures display fixtures for stores, automobile and radio accessories, household articles and various other metal products. Its present quarters are at 20 Mason street. The authorized capital is $50,000. E. W. Morgan is president; P. H. Allison, vice-president, and James A. Green, secretary-treasurer.

Mrs. John Jack, aged 51, whose husband is production superintendent at the **Hendley Machine** plant, died at the family home in Torrington on September 11.

As a result of a business administration of city affairs under the direction of a finance board made up of manufacturers and other business men, the indebtedness of the city of Torrington has been reduced by $490,102.45 in a period of two years.

The members of the Sick Aid Association of the **Excelsior Needle** plant presented a gold fountain pen recently to **D. F. Hildreth,** who recently resigned as treasurer of the association, an office which he held since the association was formed in 1914.

Torrington factories went on new schedules September 27 to conform with standard time.

The Naugatuck Valley Forest Protective Association has been formed by owners of forest lands in this section. A total acreage of 12,000 is represented among the members. One of the largest owners is the **American Brass Company.**—G. H. T.

PROVIDENCE, R. I.

October, 1, 1925.

Slight improvement is to be observed from the reports received from the different branches of the metal industries throughout the state, although none are of sufficient increase to warrant any expectancy of a "boom" in the immediate future. Manufacturers of small tools show a better feeling than has existed for many months and the building trade branches are also reporting improved conditions with an increasing amount of building operations in sight. The jewelry trades, however, still continue far below normal with but little encouragement for any material improvement this fall. This is particularly discouraging to the jewelers because this is the season when the industry should be reaping a harvest but the buying so far has failed to bring any very large orders.

There are 57 metal trade interests, either as individuals or firms that are included in the list of those that this year are assessed upon a property valuation of $50,000 or more in the city of Providence, according to the report of the Board of Tax Assessors recently certified to the City Treasurer for collection. The total value of the city's ratable property of all classes—real, tangible and intangible—is $574,920,670 which is an increase of $15,323,600 over the assessment for 1924, when the valuation reached $559,597,070.

The stock, tools, machinery and other assets of the De Luxe **Art Metal Corporation,** 9 Calender street, Providence, have been sold at auction sale in small lots to suit purchasers.

At a meeting of the directors of the **D. M. Watkins Company,** manufacturers of jewelers' findings, corner of Pine and Foster streets, Providence, V. B. Watkins was elected president and J. Cunliffe Bullock, secretary. Louis Schomhardt, Jr., who has been superintendent of the factory for the past seven years, was elected manager, to succeed the late Earl B. Williams.

The **L. J. Anshen Company,** manufacturing jewelers, 144 Pine street, Providence, has sold its machinery to the E. A. Eddy Machinery Company, while the tools for the Lorna bracelet have been sold to the H. F. Barrows Company, of North Attleboro, who will continue the production of the line. Mr. Anshen will discontinue manufacturing for the present and after a vacation will re-enter business early in 1926.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

October, 1, 1925.

With the passing of September and the advent of autumn there appears more cheerful prospects for new business among manufacturing institutions employing metals. In almost every section of the city there come reports of better business outlook and actually increased output.

This statement is quite true, and evidence of the fact is shown by the employment of scores of workmen in such plants as the **General Railway Signal Company, Bausch & Lomb Company, Eastman Kodak Company** and the **Todd Protectograph Company.** All three concerns use non-ferrous metals in large volume. The General Railway Signal Company, of course, has been quite busy since spring, due to the fact that a large number of extensive railway signal equipment contracts have been obtained and more are in prospect.

A new form of camera is being turned out in increasing supply at the Kodak plant, which fact is responsible for the added employment in that big institution.

Reports from purchasing agents indicate that the volume of manufactured products in the larger plants is much larger than a year ago and that with seasonal increase the winter months will find Rochester's metal-using plants very active indeed.

Owing to the unusual amount of new building as well as rebuilding in the business sections of the city, local dealers in sheet brass and copper, tin, aluminum and zinc are enjoying a brisk trade. The local lead market is also quite firm. Reports from the silver-plating industry go to show that a much better business prevails now than at any other time since February. The various brass foundries and electroplating establishments report a fairly generous increase in orders during the past month, and anticipate a largely improved sentiment in business during the coming winter.—G. B. E.

NEWARK, N. J.

October, 1, 1925.

The many metal plants in this city are running under prosperous conditions at the present time and in some cases extra hands are being placed at work. The plant of the **X-L Brass Foundry,** 821 Frelinghuysen avenue, was damaged by flames recently. The roof was destroyed and the interior damaged. The plant is owned by **Howard Proctor,** who was in Buffalo, N. Y., at the time.

The **New Jersey Zinc Company** will erect fifty homes at Franklin and ten at Ogdensburg for men now in the employ of the company. The contract for the work has been let to the Better Homes Development Company of New York.

A Newark concern incorporated during the month was **Universal Metal Stamping Works** with a capital of $500,000. The concern will engage in the metal stamping busness.—C. A. L.

TRENTON, N. J.

October, 1, 1925.

Conditions are greatly improved in the metal industry here and the plants are running to capacity again. Some experienced a rather dull summer, but business began to pick up in the late fall and orders became plentiful. William G. **Wherry,** president of the **Skillman Hardware Manufacturing Company,** said: "I have returned from an extended business trip and find conditions much improved. We are now running

to capacity and are looking for a busy fall and winter." **Fred A. Barton,** secretary-treasurer of the **Trenton Emblem Company,** announces that orders are on the increase for various copper and brass products turned out at his factory.

J. Harry **Hearnen,** president of the **Hearnen Storage Battery Company** and **Hearnen Safe & Lock** shop, attended the four-day session of the American Electrical Service Association at Eaglesmere, Pa. Mr. Hearnen is a member of the board of governors of the organization, having previously served as its secretary.

The following concerns have been incrprated here: **G. A. Radio Manufacturing Corporation,** West Orange, N. J., $25,000 capital, deal in radio supplies; **Sterling Art Fixture Company,** Newark, N. J., $25,000 capital, electrical fixtures; **Truxton Insulation Company,** Newark, N. J., $10,000 capital, electrical insulators; **Revive Battery Corporation,** Rutherford, N. J., $2,500,000 preferred and 250,000 shares no par to manufacture batteries; **Callite Products Company,** Union City, N. J., $25,000 to manufacture radio wires; **International Wire Company,** Union City, N. J., $25,000 capital, to manufacture wire; **Industrial Foundries, Inc.,** Hilton, N. J., 1,000 shares no par, to engage in foundry business; **Repro-Art, Inc.,** Newark, N. J., $1,000,000 capital, electrical apparatus for pianos; **Kruesheld Electric & Manufacturing Company,** Newark, N. J., $125,000 capital, electrical appliances; **Central Cutlery Company,** Elizabeth, N. J., $25,000 capital, to manufacture cutlery.—C. A. L.

PITTSBURGH, PA.

October, 1, 1925.

The metal industries throughout western Pennsylvania are slightly improved. Slightly better demand for hardware is noted, while mill and mine supplies are dull. Sanitary goods manufacturers continue to operate at capacity with prospects bright. Building materials continue in very fair demand. Industrial operations are at a slightly higher rate.

Building contracts awarded in western Pennsylvanai last month amounted to $12,194,600, according to a compilation by F. W. Dodge Corporation. This amount consisted of 423 projects. During the month there were projected 402 new projects valued at $100,932,200.

The **Aluminum Company of America,** during the past year and a half, experimenting with manufacture of furniture of aluminum, has developed its research work to such an extent that the company is contemplating entering the manufacture of these products on a more extensive scale.

The production of these articles will be at the Buffalo plant where the facilities are superior for this grade of work to those at the local plant at New Kensington, Penna. It is likely that output will be centered on some of the products in which the research work has been made, such as chairs, stuffed goods in which the frame work is made of aluminum, hall racks and mirror frames. Some work has also been done on office desks.

The furniture in the Mellon National Bank is some of that developed in the company's research work.

The **Standard Sanitary Manufacturing Company,** of Pittsburgh, has acquired a $3,000,000 plumbing wares manufacturing corporation of San Francisco.

It was stated that the factories of the Pacific coast concern, said to be the largest manufacturers of plumbing goods in the West, will come under direct supervision of the Pittsburgh officers of the purchasing corporation. The purchase is in line with the recent expansion activities of the local concern. A $5,000,000 plant was recenty completed in Baltimore, Md., and a large factory was added at the Louisville plant last year. Extensive improvements have been made at the company's potteries at Tiffin, Ohio, and Kokomo, Indiana, and warehouses have been built at Boston and San Francisco. The local factories on the North Side and at New Brighton, Pa., have been operated steadily. **Theodore Ahrens** is head of the company.

A 10-year search by safe builders for a metal which would make bank vaults safe against the attacks of the oxy-acetylene torch used by the modern scientific yeggman has been brought to a close with the construction, in Pittsburgh, of a new type of bank vault. It is the safe deposit vault of the Colonial Trust Company, and it brings into use a new metal which cannot be cut or melted by the torches which easily cut through ordinary steel. This vault, which has been under construction, was recently opened.—H. W. R.

MIDDLE WESTERN STATES

CLEVELAND, OHIO

October 1, 1925.

The fifth annual convention of the Ohio State Foundrymen's Association was held at Cedar Point, Ohio, September 3 and 4. Two hundred delegates were present. President **Allan A. Nolte** called the meeting to order at 1:30 p. m. Thursday. Officials of the organization gave reports on the progress made during the past year. A dinner-dance was held at the Convention Hall in the evening.

Sujects discussed by experts included development of electric furnaces, insurance, foundry sand, employee training and insurance. Some of the speakers on these subjects were:

Malcolm Jennings, executive secretary of the Ohio Manufacturers' Association, on "Legislation."

L. A. Hartley, director of education of National Founders' Association, on "Employee Training."

E. S. **Carman,** chief engineer of the Osborn Manufacturing Company of Cleveland, on "The Mechanical Conditioning of Foundry Moulding Sand and Its Effect Upon Cost and Quality."

The **Barnes Manufacturing Company** of Mansfield is erecting a $10,000 addition to its casting plant on North Main street. The new foundry will be brick, 60 x 80, and two stories high. Increase in business during the last year has made the addition imperative.

Cleveland and Ohio metal men learn with interest that **Arthur V. Davis,** president of the Aluminum Company of America, has been named a director of the Bank of America. He is already a director of the Mellon National Bank of Pittsburgh.

The **Federal Brass Manufacturing Company,** of Marysville, Ohio, has started operations in its new plant. The old **Standard Stamping Company** plant on North Main street was completely remodeled for the brass firm. A month ago the Federal company shut down its plant at Columbus, Ohio, preparatory to moving to Marysville. Twenty-five men will be employed in the new plant at first. The officials will take up their residence in Marysville. **T. E. Husted,** is assistant manager of the plant and **Fred Grimes,** foreman.

The **Rickersburg Brass Company,** of Cleveland, may have to seek a new location. The city desires to extend Chester avenue through the property on which the plant now stands. Part of the present building would have to be razed to permit this. No decision has yet been reached. The matter will be settled in city council soon.—S. D. I.

DETROIT, MICH

October, 1, 1925.

It is announced by the **Scott Valve Manufacturing Company** that the **H. P. Robers & Company,** Cleveland, have been appointed district representatives for the complete Scott line of bronze and iron body valves.

The **Bohn Aluminum & Brass Company** recently declared a 25 cent per share dividend on common stock and regular quarterly of 2 per cent on preferred stock, both payable October 1 to stock of record of September 15.

The **Acme Brass Works,** at Holland, Mich., recently installed a brass forgings department which ultimately will operate three hammers, the first unit of which, weighing 14,000 pounds, is in operation. It is stated the company is

working on a large contract calling for 2,200 forgings a day.

The **R-C Valve Company, Inc.,** has been incorporated at Saginaw to manufacture and deal in oil pan drain valves. The stockholders are Alvah Joseph Raymond, 201 Rellis street; Percy Anson Curran and Mervyn E. Curran, all of Saginaw.

Charles G. Streng, 54 years old, a widely known manufacturer, of Detroit, dropped dead in Ann Arbor recently from a heart attack. He was president of the **Acme Enameling & Japanning Company,** a Detroit concern.

The **Grand Rapids Welding Supply Company,** at Grand Rapids, has recently filed articles of association, with a capital stock of $50,000, $45,000 of which, it is announced, has been subscribed. **C. B. Macauley** is president of the new organization.

The **Flint Brass Works,** at Flint, Mich., are planning for the erection of an addition to its plant, it is stated. The company now has a capacity of two tons of brass daily, practically all of which goes to automobile concerns. **S. A.** and **G. J. Gutman** are owners and managers.

The **Muskegon Aluminum Foundry Company,** at Muskegon, Mich., has about completed a new foundry building. This will considerably increase the company's production facilities.

Lester G. Auberlin, purchasing agent for the **Penberthy Injector Company** of Detroit, it is announced, has succeeded **Elwood Sampson** as executive secretary of the Purchasing Agent's Association of Detroit and as editor of the "Detroit Purchaser." Mr. Auberlin has been in the employ of the Penberthy Injector Company for the last 13 years. He is a charter member of the Purchasing Agents' Association and has served as director and treasurer.

The **Edmunds & Jones Corporation,** Detroit, manufacturers of automobile lamps, gauge lamps, connectors, sockets, etc., shows that during the six months period ending June 30, net earnings applicable to the common stock amounted to $171,-513.41 or $4.29 per share on the then outstanding 40,000 shares of common stock, after allowing for taxes and preferred stock dividends. Additions to property and plant during 1924 amounted to $361,734.

The **Grimes Molding Machine Company,** Detroit, manufacturers of valves and molding machinery, reports a record business for the first six months of 1925, that indicates an increase of 50 per cent for the year as compared with 1924. This company supplies a complete line of hydrants and valves.

The brass, copper, aluminum and gray iron industries in this teritory are entering the fall months with one of the most favorable outlooks they have ever experienced. The automobile business, on which they largely depend, is forging ahead. Practically every plant in the city is operating to capacity and many of them overtime. It looks now as if these industries would be busy all through the winter months and well along into the spring.—F. J. H.

CHICAGO, ILL.

OCTOBER 1, 1925.

Business in the metal trades in Chicago, recently characterized by rather sluggish buying has picked up somewhat, and there is, with a large building and improvement program moving ahead, a very promising outlook.

The **Illinois Central** railroad, proceeding with its electrification of suburban lines, has announced that such will be completed in July, 1926, instead of February, 1927. Work of stringing the wires and putting in other electrical portions of the system, calling for use of much copper, brass and other fitting metals, is now progressing apace.

The Illinois Products Exposition, held under the auspices of the Illinois Chamber of Commerce, will open October 8 for a nine day show. A feature of Chicago's standing as a prime trade center, which will be made much of at the exposition, is its situation as the greatest jewelry market and the greatest distribution center for musical instruments in the United States.

Work is progressing apace on the Jeweler's building at Wabash avenue and the New Wacker drive. It will be a thirty-story building, with the great majority of the space devoted to manufacturing and wholesale jewelers.

The North shore of Chicago, comprising the communities of Evanston, Winnetka, Wilmette, Highland Park, Lake Forest, Glencoe and Kenilworth have been in the market heavily for metals, with a combined building program for the year of over $25,000,000. Evanston alone has been building at the rate of $1,000,000 a month.

Hornthal & Company, casket manufacturers, have leased from the American Cigar Company the modern two-story building at 1911-1953 West Roosevelt road, 456 by 115 feet, with a total floor space of 103,000 square feet. Total rental for a term of years is $325,000. Extensive alterations are planned.

The **Morgan-Gardner Electric Company,** manufacturers of electrical machinery, now located at 2640 Shields avenue, has bought of the Motor Wheel Corporation of Lansing, Mich., a one-story building, of 46,000 square feet, together with a vacant trace of 23 acres adjoining for $76,000 cash, at Harvey, Ill. After remodeling, the plant will be occupied for manufacturing purposes.

John F. Ziska, president of the **American Wire Products Company,** 1226 South Michigan avenue, Chicago, was recently made the victim of three extortioners who got from him $700 by threatening to ruin his business by making public a wholly fictitious scandal charge against him. He paid the money over on first demand, but later called in the police when an attempt was made to squeeze more from him.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

SEPTEMBER 18, 1925.

The Birmingham metal industries are keeping up fairly well. Nearly all branches of the lamp trade are busy. The lengthening of the daylight period has somewhat reduced the lamps for horse and motor vehicles, but the trade is well up to last year's level. Some orders for railway lamps have been received from South America, and business is assured for the Autumn.

The changeover from lead to copper tubes for water conveyance in connection with domestic requirements proceeds rather slowly, partly because of the natural conservatism of builders and householders. There is reason to believe, however, that the higher initial cost has much to do with the slow progress made, builders taking note merely of the effect upon the first cost. The trade in copper and bronze tubes is fairly satisfactory, but the larger use of oil propulsion for ships must, it is recognized, reduce the number of tubes required in boilers and similar plant. Most branches of the brass trade are well employed, and there is insufficiency of skilled men in certain branches. Plumbers and makers of gas and electric fittings are exceptionally busy. A common complaint is that young men are not entering the trade in the same numbers as formerly.

One result of the war has been the establishment of numerous Continental factories for the manufacture of domestic brass fittings. During the war the foreign buyers were unable to get supplies from this country and their only alternative was to provide plants of their own. Sweden has many more factories than formerly and Denmark and Norway largely supply their own requirements. All these countries have lately increased their tariffs with the object of assisting their own industries. Germany, however, is still a formidable competitor in these Continental countries.

All the firms connected with electric light and wireless apparatus are very well engaged, and wireless fittings have become a side line for many of the larger Birmingham firms. Such factories as those specializing on steel penmaking are now producing in wide variety metal fittings for electrical and wireless apparatus, making small accessories in steel, brass, bronze, copper, nickel and aluminum. Penmaking machinery very readily adapts itself to the small cutting and stampings required for the manufacture of these goods. The pen trade is rather severely hit by the low rate of the Continental exchanges, the effect of which is to increase the cost of steel pens which frequently retail at 14s. per box on the Continent, whereas the British buyer can get them at about 3s.

The customary revival in the jewelry and electroplate trade is developing, makers of nickel silver and electroplate, as well as those producing high class silverware becoming much busier. There is every probability that the activity will continue.—J. H.

Business Items---Verified

Ideal **Metal Works** have moved to 502 W. Broadway, New York.

Jean **Griffoul** has started a foundry at 48 Adams street, Newark, N. J.

R & A Plating Company has opened a shop at 218 Centre street, New York, for general plating in all metals, specializing in gold finishes.

Summit Tool & Die Company is now located at 135 Grand street, New York. This concern builds automatic machinery and makes dies; also does metal stamping.

The **Oakley Brass Foundry Company** has discontinued its foundry in Oakley, Cincinnati, Ohio. The same interests connected with the **Dayton Bronze Bearing Company** have also withdrawn.

Alloy Products Company, 1448 West Farms road, New York City, is building an office and foundry, one story, 96 x 162. This firm operates the following departments: smelting and refining; casting shop.

Pittsburgh Valve Foundry & Construction Company has appointed A. G. Hill, with offices at 45 Jarvis street, Toronto, Canada, as agent for Canada with the exception of small territory near Windsor, Ontario.

B. H. Taylor, Alcolu, S. C., is desirous of getting in touch with manufacturers of small metal stampings and small brass castings, with view to contracting for a quantity of patented combination switch locks for automobile service.

Oakland Plating Works, 3214 Wentworth avenue, Chicago, Ill., has leased a three-story building at the corner of Twenty-third and La Salle streets, for five years. This firm operates the following departments: plating, polishing, lacquering.

The **Acme Brass Works, Inc.,** Holland, Mich., has arranged for the installation of a brass forging department to develop a capacity of about 2,500 forgings per day. The present equipment will be increased with two additional hammers and auxiliary apparatus.

William M. Holmes has removed to 30 Cliff street, New York. This firm does a general plating business, specializing in nickel and bronze finishes and enameling. **A. H. McComb,** who has been connected with the firm nearly thirty years, recently purchased the business.

Holmes Bronze Foundry Company, Bedford, Ohio, has placed the general contract for foundry with H. K. Ferguson Company, Cleveland. C. L. McMasters is general manager. This firm operates the following departments: brass, bronze and aluminum foundry; grinding room, polishing.

The **American La France Fire Engine Company,** Elmira, N. Y., manufacturer of motor-driven fire apparatus, has awarded a general contract to Frederick H. Johnson, 306 West Church street, for a one-story addition, 65 x 100 ft., to be used primarily as a heat-treating plant.

The **Alexander Milburn Company,** Baltimore, Md., has offered a cash prize of $25 every month during 1925, for the best photograph or sketch of work done with Milburn apparatus. For information write to the Milburn O. A. Photo Contest, 1416-28 W. Baltimore street, Baltimire, Md.

Parker Rust-Proof Company of Indiana, Indianapolis, Ind., operates a plant and office at 830 North New Jersey street. A complete Parkerizing service or jobbing plant is maintained for the preventon of rust on iron and steel. Elmer W. Davis is president and manager and will have active charge of the business.

Ground for the Parkersburg, W. Va., plant of the **Penn Metal Company** was broken recently by the Plate Construction Company, contractors, who will erect the first unit of the plant. This unit will be completed about October 1st. Plans will be made for bringing other units of the company's three eastern plants to Parkersburg.

Federal Brass & Manufacturing Company, formerly known as the **Federal Manufacturing Company,** Columbus, Ohio, has acquired a plant at Marysville, Ohio, for expansion and improvements. S. Van Etten is secretary. This firm operates the following departments: brass foundry, brass machine shop, tool room, grinding room, plating, soldering, polishing, lacquering.

A. P. Smith Manufacturing Company, East Orange, N. J., manufacturer of hydrants and valves and other casting specialties, has purchased the plant of the Simms Magneto Company, Arlington avenue. The plant is of reinforced concrete construction, and contains about 211,000 square feet of floor space. This firm operates the following departments: brass, bronze, aluminum foundry; brass machine shop, tool room, grinding room.

A portion of the foundry of **J. B. Wise, Inc.,** Mill street, Watertown, N. Y., manufacturer of brass plumbing specialties, etc., was recently destroyed by fire, with a loss in excess of $50,000, including equipment. This firm operates the following departments: brass foundry, brass machine shop, tool room, grinding room, cutting-up shop, plating, stamping, soldering, polishing.

Diamond Power Specialty Corporation of Detroit, Mich., announces that the territory of the **Lathrop-Trotter Company,** 733 Union Trust Building, Cincinnati, Ohio, sales representatives for the Diamond Power Specialty Corporation in the Cincinnati territory for many years, has been extended to take in Indianapolis and the adjacent territory in Central and Southern Indiana.

A. Bercovich Company, Oakland, Calif., has purchased the **Electro Smelting & Alloy Company** of that city. The offices and warehouses of both companies will be located at 127 Second street, corner Oak street, Oakland. They will continue to manufacture various grades of white and red metal ingots, also buy and sell all grades of non-ferrous scrap metals, scrap iron, steel, and other waste materials.

The **Brown Instrument Company,** Philadelphia, Pa., announces the opening of a Los Angeles branch at 363 New High street, Los Angeles, Calif., with S. F. Godfrey, recently of the Braun Corporation, as district manager. Articles of incoporation having been filed in California, this branch will carry stock and conduct its own accounting direct with its customers. A complete repair department is maintained.

Following the purchase of the carbide business of the **Gas Tank Recharging Company** of Milwaukee, Wis., including acetylene plants in Milwaukee and Bettendorf, Iowa, and a carbide plant at Keokuk, Iowa, the **Air Reduction Sales Company** has created a new sales district with office at 1296 Forest Home avenue, Milwaukee, in charge of **J. S. Strate,** district manager. The new district territory comprises parts of Wisconsin, Michigan, Illinois and Iowa.

On September 21st, the directors of the **J. W. Paxson Company,** Philadelphia, dealers in foundry sands and supplies, and manufacturers of foundry equipment, sand blast machinery and dust collectors, elected Albert Walton, president and general manager of the company. **H. M. Bougher,** the retiring official, was elected chairman of the board of directors. Mr. Walton has had wide experience as an executive in handling companies engaged in various branches of the metal industries.

The employees of the **Dixie Brass & Foundry Company** of Birmingham, Ala., have been offered group life insurance totaling approximately $45,000 by their employer. A. M. Shook, Jr., president of the foundry company, was instrumental in establishing the insurance, which was underwritten by the Metropolitan Life Insurance Company, New York, on a cooperative basis, employer and employees jointly paying the premiums. Each foundry worker, who contributes to the plan, is insured for $500, which will be increased $100 after each year of service until a maximum of $1,000 is attained.

The **Fremont Aluminum Castings Company,** Fremont, Ohio, has purchased the property of the **Holtz Foundry & Manufacturing Company,** and organized with capital stock of $25,000 to produce aluminum, brass and bronze castings, automotive radiator fans and special machine work. E. J. O'Farrell, who has been in the foundry business for several years, is one of the principals, and associated with him is P. A. Gaynor, previously sales manager of the Bryan Pattern & Machine Company, Bryan, Ohio. This firm operates the following departments: bronze and aluminum foundry; brass machine shop.

S. Blickman Company, Inc., aluminum manufacturers, of 534 Gregory avenue, Weehauken, N. J., was recently damaged

by fire, which was started when a spark from a buffing machine, used to polish the aluminum household articles manufactured by the company, ignited the cloud of aluminum dust which was being drawn by suction up the ventilating shaft. The building is a modern fireproof brick structure thoroughly equipped with sprinklers. The owners assert that the fire damage was a minimum because of this protection. This firm operates the following departments: tool room, spinning plating, stamping, soldering, polishing, lacquering.

E. S. Tompkins, 90 West street, New York, has recently been awarded a contract by the International Nickel Company to design and furnish equipment for the new concentrating plant at their Huntington, W. Va., works. This plant will have a capacity of 75 to 100 tons per day to recover metallic nickel from the slags of their electric and open hearth furnaces. A special ball mill designed by Mr. Tompkins will be used, which is manufactured by the Hadfield-Penfield Steel Company, Bucyrus, Ohio. Deister Plat-O Tables will be used throughout and Wilfley Sand Pumps will handle the product from the mill as well as the table tailings, which will be pumped to low ground for filling. This plant will be ready for operation on or about December 1, 1925.

ALUMINUM SUIT

Suit for $15,000,000 against the Aluminum Company of America and its directors was filed in the Federal Court of Boston, Mass., September 30, 1925, by George D. Haskell of Springfield, president of the Bausch Machine Tool Company. Mr. Haskell charges that the directors conspired with George J. Allen of New York, and James B. Duke of Somerville, N. J., to prevent him from obtaining the needed waterpower to permit him to manufacture aluminum. The directors named are George H. Clapp, Arthur V. Davis, David Gillespie, Roy A. Hunt, Alva H. Laurie and Richard G. Mellon.

Mr. Haskell asserts that the Bausch firm used large quantities of aluminum and that he has found it hard to get the amount needed at reasonable prices. He charges that the Aluminum Company of America controls virtually all of the bauxite, the mineral from which aluminum is derived, in this country and in some foreign countries.

In 1924, he says, he decided to engage in the production of aluminum. Water power was necessary and he asserts that Duke, who was promoting a big water power project on the Saguenay River, Quebec, offered to assist him financially and to furnish him power at $12 the horsepower a year. Duke caused to be formed the Duke Aluminum Company, Ltd., with a capital of $1,000,000. Haskell charges that Davis, the president of the Aluminum Company of America, induced Duke to withdraw his assistance and this made it impossible for Haskell to carry through the project.—New York Tribune (Associated Press).

ALUMINUM COMPLAINT

Charging practices which are alleged to lessen compeptition and tend to create a monopoly in aluminum in the United States, the Federal Trade Commission, in Washington, D. C., September 24, 1925, announced that it had filed a complaint against the Aluminum Company of America.

The Aluminum Company of America, through its counsel, Gordon, Smith, Buchanan & Scott, has answered the complaint, denying that "any or all of the averments set forth in the complaint disclose any violation of law," or that the same, if true, "would justify the making or issuing of any decree" by the commission against the respondent, and asking that the complaint be dismissed.

ALUMINUM CHAIRS

The Pennsylvania Railroad has decided to equip its dining cars with aluminum chairs. The initial order was placed in Pittsburgh, September 24, 1925, with the Aluminum Company of America. This action will make the Pennsylvania Railroad the first railroad in the world to use aluminum chairs in dining cars, and these will be the first chairs built of aluminum to be used for dining purposes anywhere.

The advantage of using aluminum in place of wooden chairs in the all-steel dining cars, which are standard to the Pennsylvania Railroad, is the elimination of all fire hazard. Aluminum also provides the necessary strength and rigidity with less weight than any other material, either wood or metal.

A special type of finish will be used, harmonizing with the interior decoration of the cars. Every effort will be made to secure the maximum of comfort, and the chairs will be so upholstered as to accomplish that purposse.

GERMAN ALUMINUM SYNDICATE

German press reports have announced that negotiations in regard to the formation of an aluminum syndicate were concluded, August 1, 1925, most of the large rolling mills joining the association, whose main object is the improvement of sales and export and the exclusion of future price cuttings. A new price list was arranged, providing a considerable increase on aluminum sheets, but these prices are not final, as the association intends negotiating with wholesalers and finishers in regard to special sale conditions.—Foreign Trade Note, Department of Commerce.

SHENANDOAH SCRAP RECLAMATION

The Aluminum Company of America, with offices in Pittsburgh, Penn., was the highest bidder on junking of the wrecked Shenandoah. Bids were received by Lieutenant E. Stewart for 50,000 pounds, more or less, and the Pittsburgh concern is said to have bid 20 cents a pound. The material is composition of aluminum, copper and manganese.—N. Y. Times.

GERMAN USE OF COPPER

It has been predicted that Germany's total consumption of copper in 1925 will reach the record figure of 300,000 tons. This includes the raw copper content of alloys and scrap. The pre-war figure was 290,000 tons.—N. Y. Times.

NEW METAL FOR RADIO

The Westinghouse Lamp Company, New York, has announced that after long investigation its research laboratories had added a new metal to the world's technical resources in the form of pure metallic ductile thorium. The statement was issued by Dr. H. C. Rentschler, head of the company's research department, and Dr. J. W. Marden.

Thorium, it was said, was of particular interest to the radio enthusiasts because it was the active constituent of practically all radio tube filaments. It can now be produced commercially in filamentary form as contrasted with the minute admixture with tungsten now used. In addition to its use in radio tubes, this metal is said to be of great importance to the medical profession as a target material for X-ray tubes, being more efficient than the tungsten now in use.—New York Times.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America...	$100	$890	$920
American Hardware Corporation...	100	91	93
Anaconda Copper	50	41¾	42
Bristol Brass	25	7	10
International Nickel, com.........	25	34⅜	34½
International Nickel, pfd..........	100	99	100
International Silver, com..........	100	200	...
International Silver, pfd...........	100	105	108
National Enameling & Stamping...	100	38	38¼
National Lead Company, com.....	100	155	159
National Lead Company, pfd.....	100	114	117
New Jersey Zinc.................	100	195	195
Rome Brass & Copper............	100	130	143
Scovil Manufacturing Company....	..	225	235
Yale & Towne Mfg. Company, new	..	64	69

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

Review of the Wrought Metal Industry

Written for The Metal Industry, by J. J. WHITEHEAD, President Whitehead Metal Products Company of New York, Inc.

Practically all of the mills were running at full capacity during the month of September. The generally satisfactory conditions which have heretofore been reported were continued throughout the entire month, and there seems to be no decrease in the volume of business being placed. On the other hand, there are some departments of the mills which are overburdened with orders with the result that deliveries are quite badly in arrears. This condition is especially acute in those departments of the mills producing seamless tube and sheet copper. In both of these departments capacity production is the rule with orders coming in sufficient volume to indicate that this condition will exist for sometime to come. Many large contracts have been placed for seamless brass and copper tubes as well as condenser tubes as there seems to be a vast amount of construction work going on at this time requiring this material. There is no indication that any new applications of seamless tubes have been uncovered, but new construction work and replacements have produced a large spread of orders.

The demand for sheet copper from the building trade still continues and seems to be increasing from month to month. Speculative builders have found that it is difficult to sell a house unless it has copper conductor pipes and gutters as the public has been so well trained to look for copper trim on the houses that they will accept nothing else. This condition prevails largely in the Atlantic seaboard states, but is reported to be spreading to the rest of the country as well.

An interesting item in connection with the development of the sheet copper business is found in the fact that many of the mills are installing electro-plating apparatus for nickel plating sheet copper. This nickel plated sheet copper is entering the field which was formerly occupied by tinned copper, with the demand at the present coming more particularly from the washing machine industry. There has been some difficulty in the production of nickel plated copper due to the fact that the sheets are plated only on one side, and are of large dimension. Experimental work, however, has been going on for some time, and the production is now getting fairly well under way.

About twenty or twenty-five years ago one of the mills in the Connecticut valley produced nickel plated copper under a specially patented process, but very little of it was sold, and for a great many years it has been nothing more than a memory as far as copper mill production has been concerned. It was possible only to plate small size sheets, and the cost was too high to make it a factor. With the improvements that have been made in the electro-plating art coupled with the possible application of nickel plated sheet copper to industries that have become important factors since the war, such as the washington machine trade, experiments have been carried forward to the point where, as stated above, production is now on a commercial basis. It is expected that the cost of sheet copper, nickel plated on one side, will not be very much, if any, in excess of the cost of sheet copper tinned on one side.

Another development of interest is the announcement of a commercial line of nickel plated aluminum seamless tube. An aluminum tube is now produced with a very heavy coating of nickel plate and is found to be desirable in applications where lightness in weight is a desirable feature, coupled with the necessity for resisting acid corrosion.

The demand for pure nickel and Monel metal continues to increase as each month goes by, with the result that the mill producing these metals in rods, sheets, tubes and wire reports business to be in a condition as satisfactory as that which is reported for the brass and copper mills. Some further large applications of pure nickel sheets and tubes, in the dairy industry are reported, and tonnages of considerable size have been booked for this work. The St. Francis Hotel in San Francisco, and the new Palmer House in Chicago, are both reported to have specified pure nickel cooking utensils for their kitchens, and also for certain service dishes. In the case of the service dishes, nickel is replacing crockery, eliminating breakage.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

In the New York market there were periods of substantial activity during September based on good domestic requirements and a strong statistical position. Sales of electrolytic were effected at 14⅝c@14¾c early in the month, but inquiries increased during the first fortnight and producers succeeded in booking orders for future shipment at 14⅞ cents. A small tonnage sold as high as 15 cents for delivery in the interior. A mild and gradual reaction set in during the last half of the month, however, which gave the market a set back to 14⅜c@14½c. The downward tendency of prices was in sympathy with lower values in Europe, which naturally influenced the market here. An outstanding feature in recent developments was the large reduction in surplus stocks of refined copper in this country. The official figures showed that domestic holdings of refined copper on August 31st amounted to only 154,686,000 pounds, compared with 176,016,000 pounds on July 31st, a decrease of 21,330,000 pounds. The decrease in stocks was much greater than expectations. There was an easier tendency at close, with nearly electrolytic quoting 14¼c@14⅜c. Demand quiet.

ZINC

The market for Zinc developed more strength recently on strong statistics and an advancing foreign market. The September trend in prices was upward, and buyers were compelled to raise their bids in order to cover both current and forward requirements. Consuming demand kept up remarkably during the past month, and there is every reason to expect a good market for all grades during the balance of the year. Brass mills and galvanizers are fairly well supplied for next few weeks, but fresh business in good volume would result if price was made attractive to buyers. There was a decrease in American stocks of 3,739 tons in August, the amount in smelters hands being reduced to 17,032 tons. Production in August was 47,849 tons and deliveries for same month amounted to 51,588 tons, being the largest in seven months. The market quotes 8.17½@8.20c, New York, and 7.82½c@7.85c, East St. Louis.

TIN

The tin market displayed more strength lately and current prices have advanced to a considerably higher level than prevailed a month ago. London continues to be the dominant influence and offerings in that market were easily observed. Consumers here, however, follow the advancing trend cautiously. Dealers and importers have taken a speculative interest on signs of firmer developments in the foreign markets. Consumption continues at a high rate. The fact of increasing activity and a favorable statistical situation is expected to give further support to market conditions. Total domestic deliveries for the first eight months of 1925 were 52,195 tons, against 44,175 tons for corresponding months in 1924, an increase of 8,020 tons. American deliveries in August were 6,520 tons. September deliveries are expected to total close to the August figures. The situation in tin is regarded as a healthy one in most particulars, although present price of 59¾c@59⅞c for Straits tin compares with an average of 50.20c for 1924 and of 42.71c for 1923. The September opening was at 56½c, nearby delivery.

LEAD

Consumption of lead keeps up at a high level, and there is no indication of a serious slowing down of demand. The market has a steady undertone at 9.25c@9.35c, East St. Louis and 9.50c@9.60c, at New York. Spot supplies are apparently scarce, and the high price gives ample proof that the situation is singularly free from adverse factors. Electrical demand is using up an increased tonnage, and heavy shipments are going to makers of pipes and sheets.

Stocks of refined lead carried by reporting smelters on September 1st were 9,082 tons, compared with 17,944 tons on April 1st. Consumers, however, are inclined to pursue a cautious policy.

ALUMINUM

Aluminum developments all point to continued heavy consumption. The market is consequently strong and producers apparently have no difficulty in maintaining prices. Producers are satisfied with the outlet. Demand for last quarter of the year indicates large requirements ahead. The manufacture of aluminum furniture will open a new field of activity. The lightness of the material and its durable character is relied upon to make the new line of furniture popular for railroad coaches and office fittings. Prices quote 28c for 99% plus and 27c for 98-99% virgin metal.

ANTIMONY

Chinese holders have maintained a bullish attitude lately. Offers from that source are, therefore, at a high level, and owing to the ability of China to control shipments from the East prices are firm. Demand is not specially active for round tonnages, but with supplies limited the market is in condition to respond to fair activity. Spot antimony is held at about 17¼c, duty paid, but October-November shipment from China quotes 16¼c@16⅜c.

QUICKSILVER

Consumers are not specially active in the market, but buy according to requirements. Prices hold fairly steady at around $81.50 @$82. There were reports of shading prices.

PLATINUM

Buying was confined to ordinary lots by small consumers. A more active demand is expected from the trade interests whose requirements are not fully covered. Refined platinum continues to quote $118 an ounce.

SILVER

Recent features in silver were active buying by China and increased firmness of the market. India was also a buyer to a moderate extent. China, however, was both buyer and seller by turns. Market was, therefore, highly speculative at times. The United States government was also a buyer of considerable quantities in September for coinage purposes. London bought some Mexican product. Production of silver in North America and Peru for first eight months of this year amounted to 124,427,680 ounces. This was over a million ounces less than for same period last year. The market is 71 cents an ounce, being a decline from recent high.

OLD METALS

Markets for the non-ferrous scrap metals as a whole are easier in tone than recently. This is due to general weakening of copper and considerable uncertainty regarding the probable course of the domestic and export demand at present prices. Dealers have become cautious in loading up, especially since offerings are more generous. Aluminum, however, and other white metal grades are firm. The lead scraps, are lower than the usual equivalent warranted by the new pig metal. There is a disposition to hold heavy copper for better prices. Brass clippings, heavy brass and composition are quiet at lower prices. Export demand for the latter is also dull. Prices dealers pay are 11¾c@12c for heavy copper, 9½c@9¾c for light copper, 7c@7¼c for heavy brass, 9¼c@9½c for new brass clippings, 6c@6¼c for light brass, 7¾c@8c for heavy lead, and 22c@23c for Aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1924, 13.419—January, 1925, 15.125—February, 15.00—March, 14.375—April, 13.625—May, 13.625—June, 13.75—July, 14.25—August, 14.875—September, 14.875.

Brass Mill Zinc—Average for 1924, 7.10—January, 1925, 8.60—February, 8.00—March, 8.10—April, 7.60—May, 7.55—June, 7.55—July, 7.80—August, 8.10—September, 8.30.

Daily Metal Prices for the Month of September, 1925

Record of Daily, Highest, Lowest and Average

	1	2	3	4	*7	8	9	10	11	14	15	16
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	14.75	14.75	14.875	14.875	.....	14.875	14.75	14.75	14.85	15.00	15.00	15.00
Electrolytic	14.45	14.50	14.55	14.60	.....	14.55	14.50	14.50	14.55	14.60	14.60	14.60
Casting	14.20	14.125	14.125	14.20	.....	14.15	14.10	14.10	14.10	14.20	14.20	14.20
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb												
Prime Western	7.575	7.60	7.625	7.70	.....	7.75	7.75	7.75	7.75	7.75	7.75	7.75
Brass Special	7.70	7.70	7.725	7.80	.....	7.85	7.85	7.85	7.825	7.825	7.85	7.825
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	56.625	56.50	57.00	57.75	.....	57.75	57.25	57.75	58.25	58.35	58.50	59.00
Pig 99%	55.375	55.50	55.375	56.125	.....	56.00	55.50	56.00	56.25	56.25	56.375	56.75
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb	9.75	9.75	9.625	9.50	.....	9.25	9.25	9.25	9.35	9.25	9.25	9.25
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	.....	28	28	28	28	28	28	28
Nickel c/lb. Duty 3c/lb.												
Ingot	34	34	34	34	.....	34	34	34	34	34	34	34
Shot	35	35	35	35	.....	35	35	35	35	35	35	35
Electrolytic	38	38	38	38	.....	38	38	38	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	16.75	16.75	17.00	17.25	.....	17.125	17.00	17.00	17.00	17.00	17.00	17.00
Silver c/oz. Troy Duty Free	71.625	71.75	72.375	72.375	.....	72.00	72	72	72.125	71.625	71.00	70.875
Platinum $/oz. Troy Duty Free	118	118	118	118	.....	118	118	118	118	118	118	118

	17	18	21	22	23	24	25	28	29	30	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	15.60	14.875	14.875	14.875	14.75	14.75	14.75	14.625	14.625	14.625	15.00	14.625	14.820
Electrolytic	14.55	14.45	14.55	14.50	14.40	14.30	14.25	14.25	14.20	14.25	14.60	14.20	14.462
Casting	14.20	14.15	14.15	14.15	14.00	13.875	13.875	13.875	13.75	13.75	14.20	13.75	14.065
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	7.75	7.80	7.85	7.85	7.875	7.875	7.875	7.85	7.85	7.875	7.875	7.575	7.771
Brass Special	7.825	7.90	7.95	7.95	8.00	8.00	8.00	7.975	7.95	7.975	8.00	7.70	7.873
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	59.00	58.75	58.875	58.50	58.875	58.75	58.50	58.875	59.00	59.875	59.875	56.50	58.273
Pig 99%	56.75	56.50	57.00	56.375	57.00	57.00	56.75	57.25	57.375	58.25	58.25	55.375	56.464
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb	9.25	9.35	9.45	9.45	9.45	9.45	9.45	9.35	9.40	9.45	9.75	9.25	9.406
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	28	28	28	28	28	28	28	28	28
Nickel c/lb. Duty 3c/lb.													
Ingot	34	34	34	34	34	34	34	34	34	34	34	34	34
Shot	35	35	35	35	35	35	35	35	35	35	35	35	35
Electrolytic	38	38	38	38	38	38	38	38	38	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	17.00	17.00	17.00	17.125	17.25	17.25	17.25	17.25	17.25	17.25	17.25	16.75	17.071
Silver c/oz. Troy Duty Free	70.875	70.75	72.00	71.75	72.25	71.125	71.25	71.25	70.875	71	72.375	70.75	71.565
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	118	118	118	118	118	118

*Holiday.

Metal Prices, October 5, 1925

Copper: Lake, 14.50. Electrolytic, 14.30. Casting, 13.75.
Zinc: Prime Western, 8.00. Brass Special, 8.10.
Tin: Straits, 60.00. Pig, 99%, 58.375.
Lead: 9.45. **Aluminum,** 28.00. **Antimony,** 17.25.

Nickel: Ingot, 34.00. Shot, 35.00. Electrolytic, International Nickel Company, 38.00.
Quicksilver, flash, 75 lbs., $82.000. **Silver,** oz., Troy, $70.875.
Platinum, oz., Troy, $118.00. **Gold,** oz., Troy, $20.67.

Metal Prices, October 5, 1925

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	11 to12
Brass Ingots, Red	12 to13
Bronze Ingots	12 to13
Bismuth	$2.65to$2.70
Cadmium	60
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.50to$2.60
Manganese Bronze Castings	23 to41
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	34 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	19½to22½
Phosphor Copper, guaranteed 10%	18½to21½
Phosphor Tin, guaranteed 5%	65 to70
Phosphor Tin, no guarantee	65 to75
Silicon Copper, 10% ......according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
12 to12¼	Heavy Cut Copper	13 to13½
11¾to12	Copper Wire	12¾to13¼
10 to10¼	Light Copper	11¼to11¾
9 to 9¼	Heavy Machine Comp	10½to11
7½to 7¾	Heavy Brass	8½to 9
6½to 6¾	Light Brass	7½to 8
8 to 8½	No. 1 Yellow Brass Turnings	9½to 9¾
8¼to 8¾	No. 1 Comp. Turnings	9¾to10¼
8 to 8¼	Heavy Lead	8¾to 9
4¾to 5	Zinc Scrap	5¾to 6
10	Scrap Aluminum Turnings	12 to14
16 to17	Scrap Aluminum, cast alloyed	18 to19
20	Scrap Aluminum, sheet (new)	23 to25
32	No. 1 Pewter	36 to38
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect Aug. 7, 1925

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.19⅛	$0.20⅞	$0.22⅞
Wire	.19⅝	.21⅜	.23⅜
Rod	.16⅞	.21⅝	.23⅝
Brazed tubing	.27⅛	......	.32⅝
Open seam tubing	.27⅛	......	.32⅝
Angles and channels	.30⅛	......	.35⅝

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.20⅛	$0.21⅞	$0.23⅞
Wire	.20⅝	.22⅜	.24⅜
Rod	.17⅞	.22⅝	.24⅝
Brazed tubing	.28⅛	......	.33⅝
Open seam tubing	.28⅛	......	.33⅝
Angles and channels	.31⅛	......	.36⅝

SEAMLESS TUBING

Brass, 23¾c. to 24¾c. net base.
Copper, 24¾c. to 25¾c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21⅛c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19⅛c. net base
Muntz or Yellow Rectangular sheet other Sheathing	20⅛c. net base
Muntz or Yellow Metal Rod	17⅛c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21¾c. to 22¾c. net base
From stock	22¾c. to 23¾c. net base

BARE COPPER WIRE—CARLOAD LOTS

17c to 17¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21¼c. net base
100 lbs. to 200 lbs. in one order	21¾c. net base

ZINC SHEET

Duty, sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	11.00 basis
Casks, jobbers' price	12.25 net base
Open Casks, jobbers' price	12.75 to 13.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	26¾c.
15% "	28¼c.
18% "	29¼c.

Nickel Silver Wire and Rod

10% "	29¼c.
15% "	33¼c.
18% "	36¼c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs. 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 74 to 76c. per Troy ounce, depending upon quantity.

Rolled sterling silver 71c. to 73c.

NICKEL ANODES

90 to 92% purity	45c. per lb.
95 to 97% purity	47c. per lb.

Supply Prices, October 5, 1925

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12-.16
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., Carboys	lb.	.06
Nitric, 42 deg., Carboys	lb.	.07
Sulphuric, 66 deg., Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.24-.27½
Denatured in bbls	gal.	.60-.62
Alum—		
Lump Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, kegs	lb.	.08
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.33
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, bbls	lb.	.17
Cyanide	lb.	.50
Sulphate, bbls	lb.	.05
Copperas (Iron Sulphate, bbl.)	lb.	.01½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate, see Copperas, bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.15
Nickel—		
Carbonate dry, bbls	lb.	.29
Chloride, 100 lb. lots	lb.	.21
Salts, single bbls	lb.	.10½
Salts, double bbl.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.35-.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.093
Potassium Bichromate, casks (broken)	lb.	.08¾
Carbonate, 82-92%, casks	lb.	.06¼
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.70
Nitrate, 100 ounce lots	oz.	.49¼
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls	lb.	.04¾
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.41
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls	lb.	.11
Chloride, 600 lb. lots	lb.	.08
Cyanide	lb.	.41
Sulphate, bbls.	lb.	.03⅛

COTTON BUFFS

Open buffs, per 100 sections (nominal),

12 inch, 20 ply, 64/68, unbleached sheeting	base,	$32.40-$40.85
14 inch, 20 ply, 80/96, " "	base,	45.25- 50.80
12 inch, 20 ply, 80/96, " "	base,	47.35- 46.20
14 inch, 20 ply, 84/92, " "	base,	63.15- 62.25
12 inch, 20 ply, 88/96, " "	base.	.... 63.25
14 inch, 20 ply, 88/96, " "	base,	.... 85.15
12 inch, 20 ply, 80/96, " "	base,	.... 52.70
14 inch, 20 ply, 80/96, " "	base,	.... 70.80
Sewed Buffs, per lb., bleached or unbleached	base,	.55 to .75